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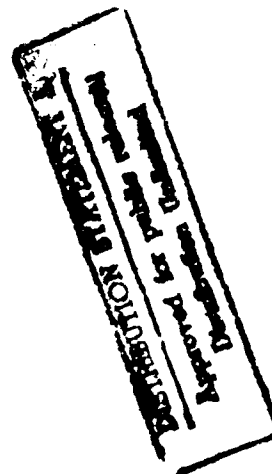
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TECHNICAL REPORT SUMMARIES



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INTRODUCTION

The Air Force Office of Scientific Research Technical Report Summaries is published quarterly (March, June, September, and December). It contains a brief summary of each technical report received in the Technical Information Division and submitted to the Defense Technical Information Center (DTIC) for that quarter. Three indexes, subject, personal author and title are provided to help the user locate reports that may be of interest.

AFOSR does not maintain copies of technical reports for distribution. However, you may obtain any of these reports if you are registered with DTIC, by requesting the AD number of that report from the DTIC, Cameron Station, Alexandria, Virginia, 22314.

PURPOSE

The purpose of this report is to inform Air Force Laboratories about the science that the Air Force Office of Scientific Research is supporting.

AFOSR MISSION

The Air Force Office of Scientific Research (AFOSR) is the Single Manager of the Air Force Defense Research Sciences Program (Program Element 61102F) and the primary Air Force agency for the extramural support of fundamental scientific research. The AFOSR is organized under the Air Force Systems Command, DCS/Technology.

AFOSR awards grants and contracts for research in areas of science relevant to the needs of the Air Force. Research is selected for support from proposals received in response to the Broad Agency Announcement originating from scientists investigating problems involving the search for new knowledge and the expansion of scientific principles. Selection is on the basis of scientific potential for improving Air Force operational capabilities, originality, significance to science, the qualification of the principal investigators, and the reasonableness of the proposed budget.

KEY TO READING THE DATA

The summaries consist of three indexes and the abstracts. From one of the indexes, locate the AD number of the report that is of interest to you. Use this number to locate the abstract of the report in the abstracts section. The first report submitted to DTIC during the quarter (the one with the lowest AD number) appears on the last page of the abstracts section. The last report submitted to DTIC during the quarter (the one with the highest DTIC number) appears on the first page of the abstracts section. The following terms will give you a brief description of the elements used in each summary of this report.

DTIC Report Bibliography - DTIC's brief description of a technical report.

Search Control Number - A number assigned by DTIC at the time a bibliography is printed.

AD Number - A number assigned to each technical report when received by the DTIC.

Field & Group Numbers - (appearing after the AD number) First number is the subject field, and the second number is the particular group under that subject field.

Corporate Author/Performing Organization - The organization; e.g., college/university, company, etc., at which the research is conducted.

Title - The title of the technical report.

Descriptive Note - Gives the type of report; e.g., final, interim, etc., and the period of the time of the research.

Date - Date of the technical report.

Pages - Total number of pages contained in the technical report.

Personal Author - Person or persons who wrote the report.

Contract/Grant Number - The instrument control number identifying the contracting activity and funding year under which the research is initiated.

Project Number - A number unique to a particular area of science; e.g., 2304 is the project number for mathematics.

Task Number - An alphanumeric number unique to a specific field of the main area of science; e.g., 2304 is the project number for mathematics and A3 is the task number for computational sciences.

Monitor Number - The number assigned to a particular report by the government agency monitoring the research. The number consists of the government monitor acronym, the present calendar year and the technical report assigned consecutively; e.g., AFOSR-IR-83-0001 is the first number used for the first technical report processed for Calendar Year 1983.

Supplementary Note - A variety of statements pertaining to a report. For example, if the report is a journal article, the supplementary note might give you the journal citation, which will include the name of the journal the article it appears in, and the volume number, date, and the page numbers of the journal.

Abstract - A brief summary describing the research of the report.

Descriptors - Key words describing the research.

Identifiers - Commonly used designators, such as names of equipment, names of projects or acronyms, the AFOSR project and task number, and the Air Force Research Program Element number.

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AD-A248769 REPORT DATE: 09 JAN 92

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AD-A248772 REPORT DATE: 09 JAN 92

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ABSTRACTS

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-B164 299L

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SCIENTIFIC SYSTEMS INC WOBURN MA

(U) Clutter Rejection Signal Processing.

DESCRIPTIVE NOTE: Final rept. 1 Jun 91-15 Jan 92.

APR 92 143P

PERSONAL AUTHORS: Mehra, Raman K.; Mahmod, Shaf jahan; Sarfaty, Ori

REPORT NO. TR-1156

CONTRACT NO. F49620-91-C-0039

PROJECT NO. 2304, 3005

TASK NO. A5, A1

MONITOR: AFOSR, XF
TR-92-0405, AFOSR

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Distribution authorized to U.S. Gov't. agencies only; Proprietary Info.; 28 Apr 92. Other requests shall be referred to Air Force Office of Scientific Research, Attn: XOT, Bolling AFB, DC 20332.

SUPPLEMENTARY NOTE: Original contains color plates: All DTIC reproductions will be in black and white.

ABSTRACT: (U) Unwanted clutter returns from natural and manmade objects are a major problem and limiting factor in the detection, tracking and classification of targets using ground based and airborne radars as well as many other sensors. A major technical objective of Phase I research was to develop image processing approaches and algorithms for detection of moving targets in highly cluttered environments and to demonstrate their effectiveness on real data. A key technical driver during Phase I work was detection of slow moving ship targets in ocean clutter from Relocatable Over-the-Horizon Radar (ROTHR) data supplied by Raytheon Company. The problem was solved using a Flexible Template Matching (FTM) approach on 4D (range, azimuth, Doppler and time) ROTHR data. A second approach based on Stochastic State Space modeling, called SRA (Stochastic Realization Algorithm)

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which leads to high resolution spectral estimation was used for clutter rejection on Lincoln Lab's Unmanned Air Vehicle (UAV) data. Finally, theoretical and algorithmic aspects of the Markov Random Field MRF) approach were developed for moving target detection in high clutter. The results of Phase I demonstrate that multidimensional image processing is highly effective for clutter rejection and weak target detection. Radar Signal Processing, Clutter Rejection, Target Detection, Flexible Template Matching, Stochastic Realization, Markov Random Field.

DESCRIPTORS: (U) *MOVING TARGETS, *RADAR SIGNALS, *RADAR CLUTTER, *OVER THE HORIZON RADAR, AIRBORNE, ALGORITHMS, APPROACH, AZIMUTH, DETECTION, ENVIRONMENTS, GROUND BASED, HIGH RESOLUTION, HORIZON, IMAGE PROCESSING, MANMADE, MATCHING, OCEANS, PHASE, PROCESSING, REJECTION, RESOLUTION, SHIPS, SIGNAL PROCESSING, TAR, TARGET DETECTION, TARGETS, TEMPLATES, TRACKING, UNMANNED, WORK, RADAR IMAGES, IMAGE PROCESSING, TARGET CLASSIFICATION.

IDENTIFIERS: (U) PE61102F, PE65502F, WUAFOSR2304A5, WUAFOSR3005A1, Clutter rejection.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A252 082 20/5 9/3

AD-A252 078 6/5

SRI INTERNATIONAL MENLO PARK CA MOLECULAR PHYSICS LAB

SRI INTERNATIONAL MENLO PARK CA

(U) Multiphoton Spectroscopy Using Tunable VUV Radiation from a Raman-Shifted Excimer Laser,

(U) In Vitro System for Studying Metabolism of Environmental Chemicals in Human Cells.

91 5P

DESCRIPTIVE NOTE: Annual rept. 30 Apr 91-29 Apr 92,

PERSONAL AUTHORS: Faris, Gregory W.; Dyer, Mark J.

MAY 92 17P

REPORT NO. MP-91-086

PERSONAL AUTHORS: Green, Carol E.

CONTRACT NO. F49620-90-C-0044

REPORT NO. LSU-2345

PROJECT NO. 2308

CONTRACT NO. F49620-91-C-0050

TASK NO. A3

PROJECT NO. 2312

MONITOR: AFOSR, XF
TR-92-0499, AFOSRTASK NO. AS
MONITOR: AFOSR, XF
TR-92-0553, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Proceedings on Short-Wavelength Coherent Radiation, v11 p58-61 1991. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) Raman shifting an ArF excimer laser in D2 and HD, and applications to two-photon spectroscopy in the vuv and near-vuv are described. Preliminary results on generation of vuv by two-photon-resonant difference-frequency mixing of an ArF laser and frequency-doubled dye laser are reported. Laser-based diagnostics, multiphoton excitation, atomic ions, vuv generation, four-wave mixing.

DESCRIPTORS: (U) *VACUUM ULTRAVIOLET RADIATION, *RAMAN SPECTROSCOPY, DIFFERENCE FREQUENCY, DYE LASERS, DYES, EXCIMER, EXCITATION, FREQUENCY, IONS, LASERS, MIXING, PHOTONS, SHIFTING, SPECTROSCOPY, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A3, Argon fluoride lasers, *Multiphoton spectroscopy, Four wave mixing.

UNCLASSIFIED REPORT

ABSTRACT: (U) The objective of the project is to establish and use an in vitro system of intact hepatocytes from rodent and human liver to develop quantitative data on the metabolism of toxic chemicals that can be used in risk assessments. The following halogenated aliphatic solvents are being studied: chloroform, 1,1,1-trichloroethane, trichloroethylene, dichloromethane, bromochloromethane, and carbon tetrachloride. During the first year of the project, experiments were performed with hepatocytes isolated from male F344 rats and the precision-cut liver slice method was established for use with rat and human liver. In the hepatocyte experiments, the cells were incubated in gastight flasks with chloroform to establish a model for measuring the rate of its disappearance. Using low concentrations of chloroform (2400 pmol per flask and 9350 pmol per flask), it was found that chloroform in the headspace of flasks containing cells rapidly decreased while it remained unchanged in control flasks. Chloroform levels in the medium also decreased with time. Future experiments will more completely characterize the kinetics of chloroform disappearance with isolated hepatocytes and compare them to precision-cut liver slices.

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AD-A252 051 20/4

UNIVERSITIES SPACE RESEARCH ASSOCIATION COLUMBIA MD

DESCRIPTORS: (U) *CARBON TETRACHLORIDE, *METABOLISM,
*TRICHLOROETHANES, CARBON, CELLS, CHEMICALS, CHLOROFORM,
CONTROL, FLASKS, HUMANS, KINETICS, LIVER, MALES, MODELS,
PRECISION, RATES, RATS, RISK, RODENTS, SOLVENTS, TIME,
TRICHLOROETHYLENE.

(U) An Unsolicited Proposal for Modeling, Identification,
and Active Control of Fluid Dynamics.

DESCRIPTIVE NOTE: Final rept. 15 Nov 88-31 Jan 92.

IDENTIFIERS: (U) PE61102F, WUAFOSR2312AS.

JAN 92 6P

PERSONAL AUTHORS: Voigt.

CONTRACT NO. AFOSR-89-0079

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR, XF
TR-92-0543, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The work accomplished in this research effort has concentrated on developing models, Theoretical tools and computational algorithms for identification and control of fluid-structure interaction problems. Eleven research publications were written under the sponsorship of this grant. Titles include: Optimal Control of Lift/ Drag Ratios on a Rotating Cylinder; Optimal Control of Viscous Flow past a Cylinder, and Analysis of Regularized Navier Stokes Equations.

DESCRIPTORS: (U) ALGORITHMS, DRAG, FLOW, BOUNDARY LAYER CONTROL, CYLINDRICAL BODIES, IDENTIFICATION, INTERACTIONS, LIFT, MODELS, RATIOS, FLUID CONTROL, VISCOUS FLOW, WORK.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A1.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A252 050 14/2 7/4 20/5 AD-A252 050 CONTINUED

CORNELL UNIV ITHACA NY

(U) A Differentially Pumped Electron-Energy-Loss Spectrometer with Multichannel Detector for Time-Resolved Studies at Intermediate Ambient Pressures, IDENTIFIERS: (U) PE61102F, AFOSR2303A2, *Electron energy loss spectrometers, HREELS(High Resolution Electron Energy Loss Spectrometer).

FEB 92 20P

PERSONAL AUTHORS: Lorraine, P. W.; Thoms, B. D.; Ho, W.

CONTRACT NO. AFOSR-88-0335

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR, XF
TR-92-0549, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Rev. Sci. Instrum., v63 n2 p1652-1670, Feb 92. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) The design, construction, and operation of a high-resolution electron-energy-loss spectrometer featuring a position-sensitive resistive anode detector and differential pumping are described. The position-sensitive detector provides a 66-fold increase in acquisition speed over a single-channel spectrometer. The differential pumping provides pressure isolation of 105 between the spectrometer elements, except the lenses, and the sample region. An optically isolated multicomputer-based control and data acquisition system provides complete spectrometer control and automated sample cleaning and characterization. The spectrometer, together with a differentially pumped supersonic molecular beamline, permits in situ measurements of the interaction of a wide range of gas molecules with solid surfaces.

DESCRIPTORS: (U) *SPECTROMETERS, ACQUISITION, ANODES, CHANNELS, CLEANING, CONSTRUCTION, CONTROL, DATA ACQUISITION, DETECTORS, ELECTRON ENERGY, ELECTRONS, ENERGY, HIGH RESOLUTION, INTERACTIONS, ISOLATION, LENSES, MEASUREMENT, MOLECULES, OPERATION, PRESSURE, PUMPING, REGIONS, RESOLUTION, SOLIDS, SURFACES, VELOCITY, GAS SURFACE INTERACTIONS, REPRINTS.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A252 046 20/6

AD-A252 018 9/3

OXFORD UNIV (UNITED KINGDOM) INORGANIC CHEMISTRY LAB

CALIFORNIA INST OF TECH PASADENA

(U) Design of Non-Linear Optical Materials Based on Coordination and Organometallic Compounds.

(U) Coupled Waveguide Gas Laser Research.

DESCRIPTIVE NOTE: Technical rept. 1 Apr 91-31 Mar 92.

DESCRIPTIVE NOTE: Final rept. 1 Jan 88-30 Jun 91.

MAY 92 5P

MAY 92 73P

PERSONAL AUTHORS: Mingos, D. M.

PERSONAL AUTHORS: Bridges, William B.; Zhang, Yongfang; Johnson, Reynold E.

CONTRACT NO. AFOSR-88-0141

REPORT NO. CITLL-92-01

PROJECT NO. 2303

CONTRACT NO. AFOSR-88-0085

TASK NO. A3

PROJECT NO. 2301

MONITOR: AFOSR, XF

TASK NO. AS

TR-92-0567, AFOSR

MONITOR: AFOSR, XF

TR-92-0542, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The aim of this research project was to design coordination and organometallic compounds which exhibit non-linear optical properties. The synthesis of pentadionate and catecholato- complexes was achieved and their second harmonic generation properties evaluated. A related program on icosahedral carboranes has resulted in a wide range of dipolar molecules whose second harmonic generation properties have been measured both in the solid state and in solution. The latter are most promising and suggest that under the appropriate packing conditions they could show large SHG effects. Recent results in the microwave processing of materials and in the area of molecular packing are also described. non-linear optics, organometallic compounds, boranes, carboranes.

DESCRIPTORS: (U) *OPTICAL PROPERTIES, *ORGANOMETALLIC COMPOUNDS, *NONLINEAR OPTICS, BORANES, CARBORANES, HARMONICS, MICROWAVES, OPTICS, SYNTHESIS, DIELECTRICS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A3.

ABSTRACT: (U) The overall objectives of this program were to study and develop an understanding of the characteristics of coupled waveguide gas lasers and to improve their operating characteristics. A flexible test bed laser was designed, fabricated and used to evaluate both ceramic and metal waveguide array structures. The strong tendency to phase lock with adjacent channels out-of-phase was confirmed. Metal waveguide walls were shown to produce power output comparable to ceramic walls. A simple metal slab laser was demonstrated with good discharge and good mode characteristics, and an unstable resonator was used to produce the lowest order cosine-Gaussian mode. A technique of coupling discharge channels with slots in the slab waveguide walls was conceived and shown to lock all-in-phase preferentially over the out-of-phase configuration. A concept for an all-metal, low-cost, microwave-excited waveguide laser using either a simple slab waveguide or the slot coupled array was developed. CO2 waveguide lasers; coupled waveguide lasers; dielectric coated waveguides; r-f excited CO2 lasers; Parallel-plate waveguide lasers.

DESCRIPTORS: (U) *GAS LASERS, *LASERS, *WAVEGUIDES, ARRAYS, CHANNELS, CONFIGURATIONS, COSTS, COUPLINGS.

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SEARCH CONTROL NO. T85005

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AD-A252 010 9/1

DIELECTRICS, LOW COSTS, METALS, MICROWAVES, OUTPUT, PHASE,
PLATES, POWER, RESONATORS, SLOTS, STRUCTURES, TEST BEDS,
TEST AND EVALUATION, WALLS.

CHRONOS RESEARCH LABS INC SAN DIEGO CA

(U) Enhanced Superconductors.

IDENTIFIERS: (U) PE61102F, WUAFOSR2301A5.

DESCRIPTIVE NOTE: Final rept.,

MAY 92 120P

PERSONAL AUTHORS: . Olsen, R. B.

CONTRACT NO. F49620-89-C-0100

PROJECT NO. 1602

TASK NO. F1

MONITOR: AFOSR, XF
TR-92-0527, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) One of the major challenges facing high temperature superconductors is the making of non-brittle materials. Based on the successful discovery of high temperature perovskite superconductors, a new class of superconducting materials is hypothesized. The proposed class will be mechanically tough and may have high critical temperatures. The proposed material will be inexpensive to manufacture and easily formed into wires and bands. The project's research goal was to detect a superconducting transition in a specific material within this proposed new class. Substantial progress was made toward this objective. In Phase I a major milestone, the bulk conversion of a precursor material, was successfully accomplished. The second model precursor polymer, polychlorofluoroethylene (PCFE), was synthesized for this study. This allowed the possibility of making low defect polyfluoroacetylene. This synthesis route yielded poly(fluoroacetylene) with a significantly lower defect density when compared to HF-eliminated fluoropolymer films. The final phase of this work was directed to synthesis of poly(2,3,5,6-tetrafluoro-para-phenylene vinylene) (PTFPV). While making significant progress in synthesizing conducting polymers with polar or polarizable groups, this study did not reach its ultimate goal of producing a model compound with all of the necessary chemical properties to test the exciton model of superconductivity.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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CONTROL DATA CORP WASHINGTON DC

DESCRIPTORS: (U) *POLYMERS, CHEMICAL PROPERTIES, CHEMICALS, EXCITONS, HIGH TEMPERATURE, MODELS, SUPERCONDUCTIVITY, SUPERCONDUCTORS, TEMPERATURE, TEST AND EVALUATION, PEROVSKITES, POLYETHYLENE, CHLORINATED HYDROCARBONS, FLUOROPOLYMERS, ACETYLENE, POLYPHENYLENES, POLYVINYLIDENES.

(U) Many-Body Perturbation Theory with a Restricted Open-Shell Hartree-Fock Reference,

NOV 91 9P

PERSONAL AUTHORS: Lauderdale, Walter J.; Stanton, John F.; Gauss, Juergen; Watts, John D.; Bartlett, Rodney J.

CONTRACT NO. AFOSR-89-0207

PROJECT NO. 2303

TASK NO. FS

MONITOR: AFOSR, XF
TR-92-0556, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Chemical Physics Letters, v187 n1.2 p21-28, 29 Nov 91. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) A new, efficient ROHF based MBPT method is presented. The method, which is non-iterative, invariant to transformations among occupied or virtual orbitals, and generalizable to any order, is illustrated by application to the UHF spin contaminated CN radical and the H + OCH₂ transition state.

DESCRIPTORS: (U) *PERTURBATION THEORY, TRANSFORMATIONS, TRANSITIONS, HARTREE FOCK APPROXIMATION, REPRINTS, QUANTUM THEORY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303FS.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A252 004 CONTINUED

AD-A252 004 7/3 7/4 20/2

OKLAHOMA STATE UNIV STILLWATER DEPT OF CHEMISTRY

(U) Theoretical Studies of the Reaction Dynamics of the Matrix-Isolated F₂+cis-d₂-ethylene System.

DEC 91 19P

PERSONAL AUTHORS: Raff, Lionel M.

CONTRACT NO. AFOSR-89-0085, F49620-92-J-0011

PROJECT NO. 2303

TASK NO. FS

MONITOR: AFOSR, XF
TR-92-0557, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. Chem. Phys. v96 n12 p8901-8918, 15 Dec 91. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) The molecular dynamics of the F₂ + cis-d₂-ethylene addition reaction and the subsequent decomposition dynamics of the vibrationally excited 1,2-difluoroethane-d₂ product isolated in Ar or Xe matrices at 12 K are investigated using trajectory methods that incorporate nonstatistical sampling to enhance the reaction probabilities. The matrix is represented by a face-centered-cubic crystal containing 125 unit cells with 666 lattice atoms in a cubic (5 X 5 X 5) arrangement. Both interstitial and substitutional sites for the F₂+cis-d₂-ethylene pair are examined. Transport effects of the bulk are simulated using the velocity reset method introduced by Riley, Coltrin, and Diestler J. Chem. Phys. 88, 5934 (1988). The potential-energy hypersurface for the system is written as the separable sum of a lattice potential, a lattice-substrate interaction, and a gas-phase potential for 1,2-difluoroethane-d₂. The first two of these have pairwise form, while the 1,2-difluoroethane-d₂ potential is identical to that employed previously to study the unimolecular reaction dynamics of matrix-isolated 1,2-difluoroethane-d₂. J. Chem. Phys. 93, 3160 (1990). The major F₂ + cis-d₂-ethylene reaction mechanism involves a four-center, concerted aB3 addition across the C = C double bond. A small contribution from an atomic

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addition mechanism that initially forms fluoroethyl and fluorine radicals is observed in a xenon matrix, but not in argon.

DESCRIPTORS: (U) *ADDITION REACTIONS, *CRYSTAL STRUCTURE, *DYNAMICS, *ETHYLENE, *FLUORINE, ADDITION, AGREEMENTS, ARGON, ATOMS, CARBON, CELLS, COEFFICIENTS, CRYSTALS, DECOMPOSITION, DELAY, DEUTERIUM, DISTRIBUTION, ELIMINATION, ELIMINATION REACTIONS, ENERGY, ENERGY TRANSFER, ENVIRONMENTS, EXCHANGE, FREQUENCY, HYDROGEN, INTERACTIONS, INTERSTITIAL, MEAN, PHASE, PHONONS, PROBABILITY, RATES, RATIOS, RECREATION, RELAXATION, REVERSIBLE, ROTATION, RUPTURE, SAMPLING, SITES, STABILIZATION, STRUCTURES, SUBSTRATES, TRAJECTORIES, TRANSFER, TRANSPORT, VALUE, VELOCITY, YIELD, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303FS, Face centered cubic crystals, *Matrix isolation, Molecular dynamics.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A252 003 7/4 7/2 20/11 20/5 AD-A252 003 CONTINUED
20/8
SITES, SPECTROSCOPY, SURFACES, TEMPERATURE, TIME,
REPRINTS.

CORNELL UNIV ITHACA NY

(U) Translationally and Vibrationally Activated Reaction
of CO₂ on Si(111)7x7. IDENTIFIERS: (U) PE61102F. WUAFOSR2303A2.

FEB 92 14P

PERSONAL AUTHORS: Lorraine, P. W.; Thoms, D. B.;
Machonkin, R. A.; Ho, W.

CONTRACT NO. AFOSR-88-0335

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR, XF
TR-92-0548, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. Chem. Phys., v96 n4 p3285-3297,
15 Feb 92. Available to DTIC users only. No copies
furnished by NTIS.

ABSTRACT: (U) The interaction of CO₂ molecules with the
Si(111) 7 X 7 surface for translational energies between
0.2 and 1.6 eV and varying vibrational energies has been
studied with time-resolved electron-energy-loss
spectroscopy (TREELS), temperature-programed desorption,
and Auger electron spectroscopy. Energy from the normal
component of translational motion has been found to
strongly increase the dissociation probability of CO₂ on
the surface. TREELS has been used to tentatively identify
the resulting surface complex as O on a Si adatom with CO
bonded in a bridging site to a next-layer Si rest atom.
This complex decomposes at 400 K to a surface oxide and
gas-phase CO. In addition, vibrational excitation has
been found to increase the initial sticking coefficient
for normal translational energies less than 0.5 eV.

DESCRIPTORS: (U) *ADATOMS, *DESORPTION, *ELECTRON ENERGY,
*ACTIVATION ENERGY, *CARBON DIOXIDE, *SILICON, ADDITION,
ATOMS, AUGER ELECTRON SPECTROSCOPY, AUGER ELECTRONS,
AUGERS, COEFFICIENTS, DISSOCIATION, ELECTRON SPECTROSCOPY,
ELECTRONS, ENERGY, EXCITATION, INTERACTIONS, LAYERS,
MOLECULES, MOTION, OXIDES, PHASE, PROBABILITY, REST.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A252 002 7/2 7/5 20/8 AD-A252 002 CONTINUED

KANSAS STATE UNIV MANHATTAN DEPT OF CHEMISTRY

Physical Quenching of NF(a1 Delta)

(U) Quenching Reactions of NF(a1 Delta) by Cl2, CIF, Br2, ICl, IF, and I2,

92 11P

DESCRIPTORS: (U) *CHEMICAL REACTIONS, *HALOGENS, *QUENCHING, *CHLORINE, *FLUORINE, *IODINE, *BROMINE, *NITROGEN, ATOMS, AUGMENTATION, CHANNELS, CHEMICALS, CONSTANTS, EXCITATION, FLOW, MOLECULES, OBSERVATION, RATES, REMOVAL, TRANSFER, UTILIZATION, VALUE, REPRINTS, REACTOR KINETICS, ELECTRONS.

PERSONAL AUTHORS: Du, Kang Y.; Setser, Donald W.

IDENTIFIERS: (U) PE61102F, WUAFDSR230381, Channels.

REPORT NO. 5-30173

CONTRACT NO. AFOSR-88-0279

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR, XF
TR-92-0551, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Physical Chemistry, v96 n6 p2553-2561, 1992. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) The reactions of NF(a1 Delta) with the molecular halogens (X2) and inter-halogens (XY) have been studied in a flow reactor at 300 K. Observation of the rate of removal of NF(a) by X2 gives the total quenching rate constants, which increase in the order listed in the title, to a value of $15 \times 10^{11} \text{ cm}^3 \text{ s}^{-1}$ for I2. The primary quenching step seems to change from reactive quenching for Cl2, CIF, and Br2, probably to give $\text{NFX} + \text{X}$, to transfer with formation of NF(X3 Sigma) for IF, ICl, and I2. The formation of NF(X3 Sigma) monitored by the excitation-transfer reaction with N2(A3 Sigma), which gives NF(b1 Sigma+). The chemical quenching channel was inferred from the absence of NF(x) formation. With ICl and I2 the NF(b1 Sigma+) concentration was enhanced for low I2 or ICl, even though NF(a1 Delta) was quenched, which suggests that I atoms are generated via utilization of 2NF(a1 Delta) molecules. The reaction with IF did not lead to enhancement of the NF(b1 Sigma+). The rate constant for quenching of NF(a) by I atoms is in the range of $(1-3) \times 10^{-11} \text{ cm}^3 \text{ s}^{-1}$. Reactions of NF(a1 Delta) with halogens, Excitation-transfer of N2(A) and NF(X3 Sigma) NF(a1 Delta) + I Reaction. Chemical Reaction vs.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A252 001 7/2 20/5 7/5 18/9
 KANSAS STATE UNIV MANHATTAN DEPT OF CHEMISTRY
 (U) Product Branching in the CO+NF (a 1Delta) Reaction,
 FEB 92 7P

PERSONAL AUTHORS: Wategaonkar, S.; Du, K. Y.; Setser, D.
 W.

REPORT NO. 5-30173

CONTRACT NO. AFOSR-88-0279

PROJECT NO. 2303

TASK NO. 81

MONITOR: AFOSR, XF
 TR-92-0550, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Chemical Physics Letters, v189 n6
 p586-591, 21 Feb 92. Available to DTIC users only. No
 copies furnished by NTIS.

ABSTRACT: (U) The product channels for the NF(a1 Delta)
 + CO quenching reaction, either chemical reaction with
 formation of NCO + F or physical quenching with formation
 of NF(X3 Sigma) + CO, have been studied in a flow reactor
 at 300 K. Laser-induced fluorescence measurements of the
 NCO concentration show that the spin-conserving chemical
 reaction is the main pathway. The yield of NCO was
 calibrated from the stoichiometric F + HNCO reaction
 giving HF + NCO. Reactions of NF(a1 Delta) with halogens,
 Chemical source of NCO, Laser Induced Fluorescence of NCO,
 Flow Reactor Kinetics.

DESCRIPTORS: (U) *CHEMICAL REACTIONS, *CARBON MONOXIDE,
 *NITROGEN, CHANNELS, CHEMICALS, FLOW, FLUORESCENCE,
 HALOGENS, KINETICS, LASER INDUCED FLUORESCENCE, LASERS,
 MEASUREMENT, QUENCHING, REACTOR KINETICS, YIELD, REPRINTS,
 OXYGEN, FLUORINE, ATOMS, ELECTRONS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B1, *Product
 branching, *Nitrogen fluoride radicals, Isoelectronic
 radicals.

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AD-A251 965 7/4 20/10 12/3

FLORIDA UNIV GAINESVILLE QUANTUM THEORY PROJECT

(U) Coupled-Cluster Open-Shell Analytic Gradients:
 Implementation of the Direct Product Decomposition
 Approach in Energy Gradient Calculations,

AUG 91 17P

PERSONAL AUTHORS: Gauss, Juergen; Stanton, John F.;
 Bartlett, Rodney J.

CONTRACT NO. AFOSR-89-0207

PROJECT NO. 2303

TASK NO. FS

MONITOR: AFOSR, XF
 TR-92-0558, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Chemical Physics, v95 n4
 p2623-2638, 15 Aug 91. Available only to DTIC users. No
 copies furnished by NTIS.

ABSTRACT: (U) Analytic energy gradients for the coupled-
 cluster singles and doubles (CCSD) method have been
 implemented for closed-shell systems using restricted
 Hartree-Fock (RHF) and open shell systems using
 unrestricted Hartree-Fock (UHF) reference functions. To
 achieve maximum computational efficiency, the basic
 theory has been reformulated in terms of intermediates,
 thus reducing the number of required floating-point
 operations, and all computational steps are given in
 terms of matrix products in order to exploit the vector
 capabilities of modern supercomputers. Furthermore, the
 implementation has been designed to take full advantage
 of Abelian symmetry operations. To illustrate the
 computational efficiency A of our implementation and in
 particular to demonstrate the possible savings due to the
 exploitation of symmetry, computer timings and hardware
 requirements are given for several representative
 chemical systems. In addition, the newly developed
 analytic CCSD gradient methods are applied to calculate
 the equilibrium geometry and energy splitting of the
 lowest singlet and triplet states of the C402 molecule.
 coupled-cluster, open-shell, PES, gradients.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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AD-A251 963 20/6 7/6 20/14 14/1

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES

DESCRIPTORS: (U) *QUANTUM CHEMISTRY, *MATHEMATICAL ANALYSIS, ADDITION, CHEMICALS, COMPUTERS, EFFICIENCY, ENERGY, FUNCTIONS, GEOMETRY, GRADIENTS, MOLECULES, NUMBERS, OPERATION, REQUIREMENTS, SAVINGS, SPLITTING, SUPERCOMPUTERS, SYMMETRY, THEORY, TILES, REPRINTS, PERTURBATION THEORY, COMPUTATIONS, HARTREE FOCK APPROXIMATION.

(U) Studies of Optical Beam Phase-Conjugation and Electromagnetic Scattering Process.

DESCRIPTIVE NOTE: Annual rept. 1 Dec 90-30 Nov 91,

MAY 92 64P

IDENTIFIERS: (U) PE61102F, WUAFOSR2303FS, *Molecular geometry, Coupled cluster theory, *Energy gradients.

PERSONAL AUTHORS: Hellwarth, Robert W.

PROJECT NO. 2301

TASK NO. AS

MONITOR: AFOSR, XF
TR-92-0525, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) In this project we have performed both experimental and theoretical studies of optical beam phase-conjugation and of electromagnetic scattering and propagation with intense optical fields. We have: (1) made measurements of high-power four-wave mixing in many new polymers synthesized at USC to characterize their nonlinear optical properties; (2) made what we believe is the first observation of nonexponential attenuation of a weak optical beam in a homogeneous (highly scattering) medium; (3) achieved the first time-of-flight measurements of electron drift velocities in photorefractive insulating crystals, finding trap-limited room temperature mobilities approx. 0.2 sq cm V^{-1} to the -1 s to the -1 and conduction band mobilities over an order of magnitude larger, also at room temperature; and (4) achieved the first low energy (approx. picojoule) optical logic gates in resonant atomic vapors. Optical beam phase-conjugation. Nonlinear optics. High power optical beam propagation. Photorefractive effect.

DESCRIPTORS: (U) *ELECTROMAGNETIC SCATTERING, *POLYMERS, *HOLOGRAPHY, *OPTICAL MATERIALS, *OPTICAL PROPERTIES, ATTENUATION, CONDUCTION BANDS, CRYSTALS, DRIFT, ELECTRONS, ENERGY, HIGH POWER, LOGIC, LOW ENERGY, NONLINEAR OPTICS, OBSERVATION, OPTICS, POWER, PROPAGATION, ROOM TEMPERATURE, VELOCITY, OPTICAL WAVEGUIDES, PHOTOCONDUCTIVITY, OPTICAL ANALYSIS, REFRACTION, LIGHT SCATTERING, ELECTROMAGNETIC FIELDS, OPTICAL IMAGES.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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AD-A251 947 20/6

ROCHESTER UNIV NY DEPT OF CHEMISTRY

IDENTIFIERS: (U) WUAFOSR2301AS, Photorefraction, Atomic vapors, Phase conjugation.

(U) Transient Gratings, Four-Wave Mixing and Polariton Effects in Nonlinear Optics.

JUN 91 68P

PERSONAL AUTHORS: Knoester, Jasper; Mukamel, Shaul

CONTRACT NO. AFOSR-90-0054

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR. XF
TR-92-0486, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Nonlinear optical susceptibilities provide a convenient means of relating macroscopic optical measurements to microscopic models. The susceptibilities are useful as long as the radiation field and the material degrees of freedom are weakly coupled. In the opposite case, the dynamics is interpreted in of combined radiation-nmw modes (polaritons) and susceptibilities are usually not used. In this review we analyze both situations from a unified dynamical framework based on equations of motion. The present formalism is also particularly suitable for the calculation of optical nonlinearities in nanostructures with restricted geometries. The transient grating and its frequency-domain analogue (degenerate four wave mixing) are used to illustrate the formalism in both the strong and the weak radiation-matter coupling limit. Four wave mixing, Transient grating, Polaritons, Exciton transport, Local fields.

DESCRIPTORS: (U) *NONLINEAR OPTICS, COUPLINGS, DEGREES OF FREEDOM, DYNAMICS, EQUATIONS OF MOTION, EXCITONS, FREQUENCY DOMAIN, GRATINGS(SPECTRA), MATERIALS, MEASUREMENT, MIXING, MODELS, MOTION, RADIATION, TRANSIENTS, TRANSPORT PROPERTIES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B3, Four wave mixing, Polaritons.

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AD-A251 918 9/1

YALE UNIV NEW HAVEN CT DEPT OF ASTRONOMY

CALIFORNIA UNIV BERKELEY SPONSORED PROJECTS OFFICE

(U) Development of a System for Accurate Forecasting of Solar Activity.

(U) Magnetic Resonance of Defects in Heteroepitaxial Semiconductor Structures.

DESCRIPTIVE NOTE: Annual rept. 15 Oct 90-14 Oct 91.

DESCRIPTIVE NOTE: Final rept. 15 Apr 88-14 Jul 91.

OCT 91 18P

MAY 92 10P

PERSONAL AUTHORS: Sofia, Sabatino

PERSONAL AUTHORS: Weber, Eicke R.

CONTRACT NO. AFOSR-91-0053

CONTRACT NO. AFOSR-88-0162

PROJECT NO. 2311

PROJECT NO. 2305

TASK NO. A1

TASK NO. C1

MONITOR: AFOSR, XF
TR-92-0315, AFOSRMONITOR: AFOSR, XF
TR-92-0522, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Theoretical work focused on solar and stellar convection by calculating models of compressible, magnetized convection in two and three-dimensions. The treatment of radiation transfer in the convection models was improved. Magnetic convection on all scales was studied to determine both the role of the fine scale magnetic structure and the sun's global magnetic fields and their relation to the solar cycle. Progress has been made in understanding turbulent magnetic diffusion which exerts a strong influence on the formation of magnetic field structures on all scales. The experimental work involved a balloon flight of the Solar Disk Sextant in New Mexico and the subsequent data reduction and analysis. Results showed the capability of the instrument to detect variations of the solar diameter at the few milli arcsecond level. This result fulfilled the design goal of the experiment.

DESCRIPTORS: (U) *SOLAR RADIATION, *SOLAR CYCLE, *CONVECTION(ATMOSPHERIC), BALLOONS, CONVECTION, CYCLES, DATA REDUCTION, DIAMETERS, TURBULENT FLOW, DIFFUSION, DISKS, FINES, FLIGHT, GLOBAL, MAGNETIC FIELDS, MODELS, RADIATION, REDUCTION, SEXTANTS, STRUCTURES, TRANSFER, VARIATIONS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2311A1.

AD-A251 940

AD-A251 918

UNCLASSIFIED

DESCRIPTORS: (U) *MAGNETIC RESONANCE, *SEMICONDUCTORS,

ABSTRACT: (U) Investigations of magnetic resonance of defects in epitaxial semiconductors resulted in a pioneering study of the defects present in thin film GaAs grown by MBE at temperatures between 190 and 300 C. These novel epitaxial semiconductor thin films are of great technological interest, e.g., as buffer layers to avoid sidegating of FETs or in ultrafast detectors with response times in the femtosecond range. A comprehensive analysis by magnetic resonance, infrared absorption, Hall effect, x-ray diffraction, and particle-induced X-ray emission showed that the transport in these very As-rich layers is dominated by a hitherto unknown kind of hopping conduction between localized arsenic antisite defects present in concentrations up to $10^{20}/\text{cm}^3$ that are partly compensated by up to $10^{18}/\text{cm}^3$ acceptors. The total concentration of excess As reached values of $6 \times 10^{20}/\text{cm}^3$, corresponding to $\text{As/Ga} = 1.03$. This was found together with a lattice expansion of up to 0.15%. Thermal annealing to temperatures higher than 500 C resulted in disappearance of the lattice expansion, a reduction of the antisite defect concentration, by at least two orders of magnitude, and the disappearance of hopping conduction. A new superconducting phase with a transition temperature of 10 K was discovered after in diffusion into GaAs.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A251 918 CONTINUED

AD-A251 895 6/5

*GALLIUM ARSENIDES, ANNEALING, ARSENIC, DIFFUSION,
EMISSION, HALL EFFECT, RESONANCE, THIN FILMS, TRANSITION
TEMPERATURE, X RAY DIFFRACTION, EPITAXIAL GROWTH.

ILLINOIS UNIV AT URBANA DEPT OF CELL AND STRUCTURAL
BIOLOGY

IDENTIFIERS: (U) Heteroepitaxial semiconductor
structures.

(U) The Organization of the Suprachiasmatic Circadian
Pacemaker of the Rat and Its Regulation by
Neurotransmitters and Modulators.

DESCRIPTIVE NOTE: Annual rept. 1 Apr 91-31 Mar 92.

MAY 92 31P

PERSONAL AUTHORS: Gillette, Martha U.

CONTRACT NO. AFOSR-90-0205

PROJECT NO. 3484

TASK NO. A4

MONITOR: AFOSR. XF
TR-92-0564, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Our research addresses the cellular organization and regulation of a biological clock that controls daily (circadian) rhythms of behavior (e.g., performance), physiology and metabolism in mammals. This clock, located in the brain's suprachiasmatic nucleus (SCN), can be removed in a slice of hypothalamus, maintained in a life support system for up to 3 days and studied directly. Using this approach, progress in year 2 of this award has been made in: (1) further localizing time-keeping properties within the SCN of rat, (2) identifying electrophysiological properties of neurons in the major SCN subdivisions, (3) establishing regulatory roles for serotonin, a neuromodulatory input from the brain's arousal center in the raphe nuclei, as well as for neuropeptide Y, an input from the intergeniculate area, (4) determining the level of glutamic acid decarboxylase (GAD), the biosynthetic enzyme for the inhibitory neurotransmitter GABA, in SCN over the circadian cycle, and (5) examining the potential roles of excitatory and inhibitory amino acids in regulation of the SCN by retinal inputs carried by the optic nerve. This project involves both individual and interactive research projects at the University of Illinois and the USAF School of Aerospace Medicine. Brain slice, Circadian

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A251 895 CONTINUED

AD-A251 887 20/11 11/9

rhythm, Electrophysiology, Excitatory amino acids, Glutamic acid decarboxylase, Neuropeptide Y, Nitric Oxide, Pacemaker, Serotonin.

DESCRIPTORS: (U) *CIRCADIAN RHYTHMS, *LIFE SUPPORT SYSTEMS, ACIDS, AEROSPACE MEDICINE, AMINO ACIDS, APPROACH, AWARDS, BIOLOGICAL RHYTHMS, BRAIN, CLOCKS, CYCLES, ELECTROPHYSIOLOGY, ENZYMES, GLUTAMIC ACID, HYPOTHALAMUS, ILLINOIS, INPUT, MAMMALS, MEDICINE, METABOLISM, NERVE CELLS, NERVES, NEUROTRANSMITTERS, NUCLEI, OPTIC NERVE, OPTICS, ORGANIZATIONS, OXIDES, PACEMAKERS, PHYSIOLOGY, REGULATIONS, SCHOOLS, SEROTONIN, TIME, UNIVERSITIES.

IDENTIFIERS: (U) PE61103D, WUAFOSR3484A4, *Pacemakers.

ILLINOIS UNIV AT URBANA DEPT OF CIVIL ENGINEERING

(U) Experimental and Analytical Studies on the Kinematics of a Damage Zone during Fatigue Fracture.

DESCRIPTIVE NOTE: Final rept. Sep 89-Apr 92.

APR 92 85P

PERSONAL AUTHORS: Botsis, John

CONTRACT NO. AFOSR-89-0505

PROJECT NO. 2302

TASK NO. 8S

MONITOR: AFOSR, XF
TR-92-0530, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This report provides a summary of the results obtained in a research program on damage evolution before crack initiation and during slow crack propagation on a model material. First the main results on crack initiation are given. Subsequently, damage evolution within a process zone is described in some details. Results of the effects of stress rate and stress level on crack damage evolution is presented next. In appendix A, an approximate method to evaluate energy release rates due to damage growth is applied using the data on crack initiation. Crack Initiation, Crack propagation, Damage, Process Zone Affine Transformation, Energy Release Rate.

DESCRIPTORS: (U) *CRACK PROPAGATION, *FATIGUE(MECHANICS), *POLYSTYRENE, CRACKS, DAMAGE, ENERGY, MATERIALS, MODELS, RELEASE, TRANSFORMATIONS, DAMAGE ASSESSMENT, KINEMATICS, CYCLIC LOADS, CRAZING, DEFECTS(MATERIALS).

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AD-A251 876 24/7

AD-A251 876 CONTINUED

ILLINOIS UNIV AT URBANA INST FOR ENVIRONMENTAL STUDIES

(U) Mechanisms and Effects of Plant Activation of Chemicals in the Environment.

DESCRIPTIVE NOTE: Annual rept. 30 Sep 91-30 Apr 92.

APR 92 16P

PERSONAL AUTHORS: Plewa, Michael J.

CONTRACT NO. AFOSR-91-0432

PROJECT NO. 2312

TASK NO. A4

MONITOR: AFOSR, XF
TR-92-0560, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Plants can activate promutagens into stable mutagens and these genotoxic agents may be hazardous to the environment and to the public health. Using m-phenylenediamine (m-PDA) as a archetype compound we developed a working model for plant-activation. (1) The aromatic amine is transported into the plant cell, (2) intracellular peroxidase oxidizes the molecule (3) the metabolite is conjugated to a macromolecule, (4) the amine-conjugate is secreted into the extracellular medium, (5) the conjugate or a deconjugated plant-activated metabolite is absorbed by the *Salmonella* tester strains, (6) the plant-activated N-hydroxylated product is acetylated and deacetylated by the bacterial acetylCoA: N-hydroxyarylamine O-acetyltransferase, and (7) the deacetylation results in a highly reactive nitrenium ion that can react with or adduct to DNA. The relative potency of six plant-activated aromatic amines is 2-aminofluorene > benzidine > m-phenylenediamine > 4-aminobiphenyl > 2,4-diaminotoluene. 2-Naphthylamine was not plant-activated. From a structure-function perspective, there appears to be some correlation between free diamino functional groups. These structure-function relationships are expressed by the relative plant-activation potency of m-PDA and 2,4-diaminotoluene, and benzidine and 4-aminobiphenyl. The plant-activated products are stable, and are associated with a

macromolecule (>300 kDa). The plant-activated product is further metabolized by cells with high acetyl-CoA: N-hydroxyarylamine O-acetyltransferase activity. The possibility exists that these plant-activated products maybe formed into non-toxic proximal mutagens in intact plants that can be metabolized back into potent frameshift mutagens in organisms that consume the plants.

DESCRIPTORS: (U) *ENVIRONMENTS, *FOOD CHAINS, *METABOLITES, *PUBLIC HEALTH, ACTIVATION, AMINES, CELLS, CHAINS, CORRELATION, FOOD, FUNCTIONS, HEALTH, IONS, MODELS, MUTAGENS, PEROXIDASES, PHENYLENEDIAMINES, POTENCY, SALMONELLA, STRUCTURES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2312A4.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A251 863 CONTINUED

POLYTECHNIC UNIV FARMINGDALE NY DEPT OF AEROSPACE
ENGINEERING

(U) Optimum Aeroelastic Characteristics for Composite
Supermaneuverable Aircraft.

DESCRIPTIVE NOTE: Final technical rept. Sep 89-Oct 91,

DEC 91 144P

PERSONAL AUTHORS: Oyibo, Gabriel A.; Bentson, James;
Weisshaar, T. A.

REPORT NO. POLY-AE-91-10

CONTRACT NO. AFOSR-89-0055

PROJECT NO. 2302

TASK NO. B1

MONITOR: AFOSR, XF
TR-92-0532, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The investigation of an aeroelastically induced constrained warping phenomenon for a composite, supermaneuverable type aircraft wing has continued in this second phase of the study. The first phase investigation was concentrated mainly on the static phenomena and the search for closed form solutions for free vibration of aircraft wings having constrained warping in the presence of elastic coupling. The wing is analytically modelled as a straight flat laminated plate. Various forms of highly simplified aerodynamic loads are employed in the analysis. The free vibrations and stability aspects of this phenomenon are examined to obtain some physical insights and to determine its importance and/or design implications. Analytical tools employed include and affine transformation concept which was formulated previously. An evolution of effective warping parameters with which to study this phenomenon was carried out. The virtual work theorem and variational principles were used to derive the equations of motion based on the assumed wing displacements. The existence of closed-form free vibrations solutions for composite wings with elastic coupling and constraint of warping was

established. A revelation from these closed-form solutions is that elastic coupling lowers the first coupled frequencies.

DESCRIPTORS: (U) *COMPOSITE WINGS, *COMPOSITE MATERIALS, *MANEUVERABILITY, *AEROELASTICITY, *AERODYNAMIC LOADING, PLATES, LAMINATES, EQUATIONS OF MOTION, VIBRATION, DISPLACEMENT, AERODYNAMIC CHARACTERISTICS, ELASTIC PROPERTIES, FLUTTER, CANTILEVER BEAMS, AIRCRAFT, TRANSONIC FLOW.

IDENTIFIERS: (U) Warping, Virtual Work, PE61102F, WUAFOSR2302B1.

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AD-A251 843 CONTINUED

AD-A251 843 1/1 1/3

NOTRE DAME UNIV IN DEPT OF AEROSPACE AND MECHANICAL
ENGINEERING

(U) The Unsteady Aerodynamics of a Delta Wing Undergoing
Large Amplitude Pitching Motions.

DESCRIPTIVE NOTE: Final rept. Jul 90-Apr 91,

APR 92 243P

PERSONAL AUTHORS: Nelson, Robert C.; Thompson, Scott A.

CONTRACT NO. AFOSR-90-0321

PROJECT NO. 2307

TASK NO. CS

MONITOR: AFOSR, XF
TR-92-0500, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The goal of this study was to examine the relationship between the aerodynamic loads and the vortex flow characteristics of a highly swept delta wing (70 deg sweep) undergoing both steady and unsteady pitching motions. The effects of several parameters were examined, including motion amplitude, pitching frequency, Reynolds number, and leading edge geometry. The unsteady surface pressure data could be separated into two regimes dependent on the angle of attack range: a regime where quasi-steady behavior occurred, and a regime where significant unsteady effects occurred. The first regime included angle of attack ranges which precluded the occurrence of vortex breakdown, and ranges for which breakdown existed on the wing throughout the motions. The second regime included angle of attack ranges where breakdown moved onto or off of the wing, and ranges which included very high angles of attack involving full scale leeward flow separation. For the second regime, the unsteady effects occurred in the form of a hysteresis in the surface pressures relative to the steady case. It appeared that either the onset of breakdown or the reformation of the vortex system (at very high incidences) was responsible for the unsteady effects. Unsteady Aerodynamics, Dynamic Stall, Slender Wings, Flow Visualization.

DESCRIPTORS: (U) *AERODYNAMIC LOADING, *DELTA WINGS, AMPLITUDE, ANGLE OF ATTACK, ANGLES, ATTACK, BEHAVIOR, DYNAMICS, EDGES, FLOW SEPARATION, FLOW VISUALIZATION, FREQUENCY, GEOMETRY, HIGH ANGLES, HYSTERESIS, LEADING EDGES, MOTION, NUMBERS, PARAMETERS, PRESSURE, REYNOLDS NUMBER, SCALE, SEPARATION, SURFACES, UNSTEADY FLOW.

IDENTIFIERS: (U) WUAFOSR2307CS, PE61102F.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85035

AD-A251 842 5/9

AD-A251 841 6/4 3/1

WASHINGTON STATE UNIV PULLMAN DEPT OF PSYCHOLOGY

GALILEO FOUNDATION EL CERRITO CA

(U) Learning from Text: A Cognitive Control Perspective.

(U) Proceedings of the International Meeting of the IUPS Commission on Gravitational Physiology (13th Annual) held in San Antonio Texas on September 29 - October 3, 1991.

DESCRIPTIVE NOTE: Final rept. 1 Nov 90-31 Mar 92.

MAY 92 15P

DESCRIPTIVE NOTE: Final rept.,

PERSONAL AUTHORS: Whitney, Paul

OCT 91

266P

CONTRACT NO. AFOSR-91-0068

PERSONAL AUTHORS: Pace, Nello

PROJECT NO. 2313

CONTRACT NO. AFOSR-91-0383

TASK NO. A4

PROJECT NO. 2312

MONITOR: AFOSR, XF
TR-92-0563, AFOSR

TASK NO. A5

MONITOR: AFOSR, XF
TR-92-0568, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The studies centered on investigations of differences in text processing strategies associated with differences in the capacity to keep information active in memory (working memory capacity). A series of experiments showed that readers low in working memory capacity try to compensate for this deficit by forming very concrete interpretations of a text. Such readers will use a goal to guide comprehension at the expense of less goal-relevant information. Expository text was also used to determine if differences in working memory affect what is learned from instructional text. The results showed that readers low in working memory span have less ability to keep the overall topic in mind as they read. These readers do attempt to compensate by reinstating the topic in memory at the end of the text. The results showed that theories must address how working memory resources are flexibly allocated during reading. Cognition, Text processing, Working memory individual differences.

DESCRIPTORS: (U) *COGNITION, *MEMORY (PSYCHOLOGY), *LEARNING, *COMPREHENSION, CONCRETE, PROCESSING, READING, RESOURCES, STRATEGY, TEXT PROCESSING.

IDENTIFIERS: (U) WUAFOSR2313A4, PE61102F.

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UNCLASSIFIED REPORT

ABSTRACT: (U) The International Commission of IUPS on Gravitational Physiology held its 13th Annual Meeting September 29 - October 3, 1991, in San Antonio, Texas, USA. The scientific program of the Commission's Annual Meeting included four symposia with invited papers dealing with (1) Gravitational Cell Physiology (organizer A. Cogoli), (2) Current Concept in Gravitational Physiology (organizer N. Pace), (3) Physiology of High-G Loadings (organizer R.R. Burton), (4) Mathematical Modelling in Gravitational Physiology (organizer R. Latham). A symposium with invited paper sponsored by the Commission and devoted to NASA Spacelab Life Sciences-1 Mission: Preliminary Findings was also held. The number of invited papers belonging to these symposia totaled 43. In addition, the program contained 5 open sessions on a variety of topics in the gravitational area, with the number of voluntary papers submitted totaling 57.

DESCRIPTORS: (U) *PHYSIOLOGY, *GRAVITY, INTERNATIONAL, LIFE SCIENCES, SYMPOSIA, SPACE SCIENCES.

IDENTIFIERS: (U) WUAFOSR2312A5, PE61102F, Cardiopulmonary function, Musculoskeleton function, Neurovestibular function, *Gravitational physiology.

AD-A251 841

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO T85005

AD-A251 840

20/4

AD-A251 840 CONTINUED

WICHITA STATE UNIV KS DEPT OF MATHEMATICS AND STATISTICS

(U) Free Boundary Problems for Inviscid Flows with Vorticity.

DISTRIBUTION, EQUATIONS, GLOBAL, ITERATIONS, LAYERS, MODELS, PARAMETERS, PRESSURE DISTRIBUTION, SEPARATION, VELOCITY, WAKE, WORK.

DESCRIPTIVE NOTE: Final rept. 1 May 89-31 Mar 92.

IDENTIFIERS: (U) WUAFOSR2304A3, PE61102F, Schwarz
Christoffel method.

MAR 92 18P

PERSONAL AUTHORS: Elcrat, Alan

CONTRACT NO. AFOSR-89-0323

PROJECT NO. 2304

TASK NO. A3

MONITOR: AFOSR, XF
TR-92-0566, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) If the tangential component of velocity in the boundary layer becomes negative, the layer will thicken and in a short distance the assumptions leading to the boundary layer equations are no longer satisfied. One says the boundary layer has separated. If separation occurs a global description of the flow along the lines of the iteration alluded to above is much more difficult. In this proposal they will attempt to deal with the problem. They combine a boundary layer calculation with a free streamline wake flow for the outer potential flow. In the iteration, a separation point is determined by the boundary layer equations, a wake flow is computed and the pressure distribution on the unseparated part of the boundary. The wake flow uses Tulin's double spiral vortices to terminate a near wake and connect with free streamlines which come together at infinity downstream. This model was proposed and developed in the work; a version with improved numerical implementation. The body is approximated by a polygon, and Schwarz-Christoffel methods are used; the computational work is in computing Schwarz-Christoffel parameters and once this is done the solution is given by an analytic expression.

DESCRIPTORS: (U) *BOUNDARY LAYER, *POTENTIAL FLOW, *VORTICES, *INVISCID FLOW, BODIES, BOUNDARIES,

AD-A251 840

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A251 832 14/2 20/8

ADELPHI TECHNOLOGY INC PALO ALTO CA

(U) A Coherent X-Ray Source Using Transition Radiation.

DESCRIPTIVE NOTE: Final rept. Jul 91-Feb 92.

FEB 92 52P

PERSONAL AUTHORS: Piestrup, M. A.; Li, Qiang; Ho, A. H.;
Boyers, D. G.

CONTRACT NO. F49620-91-C-0041

PROJECT NO. 3005

TASK NO. A1

MONITOR: AFOSR, XF
TR-92-0528, AFOSR

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Original contains color plates: All
DTIC and NTIS reproductions will be in black and white.

ABSTRACT: (U) The major goal of this work was to establish the commercial feasibility of a compact, quasimonochromatic, collimated x-ray source. We analyzed x ray emission from foil stacks with uniform foil thickness and spacing, known as coherent transition radiation. We found that compared with ordinary, or incoherent radiators, these sources can have reduced angles of emission as well as increased brightness. In addition, the radiation pattern is confined to a narrower range of angles, allowing for more efficient focusing using grazing incidence optics, and resulting in even higher x-ray intensities. Our findings were based on both theoretical and experimental work. We measured x rays in the 1-5 kev energy range, generated by a coherent transition radiator composed of 35 mylar foils. We were also able to focus transition radiation using simple cylindrical optics. Submillimeter spot sizes have been obtained with incoherent radiators. The effects of emittance on the electron beam as well as errors in the foils spacing were studied using computer simulation we developed. The brightness of the source was found to compare favorable with synchrotron radiators.

AD-A251 832 CONTINUED

DESCRIPTORS: (U) *X RAY APPARATUS, ANGLES, BRIGHTNESS, ELECTRON BEAMS, ELECTRONS, EMISSION, EMITTANCE, ENERGY, ERRORS, FOCUSING, GRAZING, PATTERNS, RADIATION, RADIATION PATTERNS, SIMULATION, SYNCHROTRONS, THICKNESS, TRANSITIONS, X RAYS, COLLIMATORS.

IDENTIFIERS: (U) WUAFOSR3005A1, *X ray optics.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A251 807 CONTINUED

AD-A251 807 21/3

HUGHES RESEARCH LABS MALIBU CA

(U) Ionized Cluster Beams for Space Propulsion.

DESCRIPTIVE NOTE: Final rept. 28 Sep 90-28 Feb 92.

MAY 92 41P

PERSONAL AUTHORS: Williamson, W. S.; Knauer, W.

CONTRACT NO. F49620-90-C-0085

PROJECT NO. 2308

TASK NO. AS

MONITOR: AFOSR, XF
TR-92-0537, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Ionized clusters formed from atomic or molecular gases possess higher mass than the heavy inert-gas ions presently used as propellants in electrostatic ion-propulsion systems; this study has investigated the possibility of using these heavy clusters in an electrostatic thruster to permit operation in an intermediate range of specific impulse (1000 to 2000 s) in which there is a need for efficient electric propulsion. Clusters are formed when gases expand through a supersonic nozzle; when a low-mass carrier gas such as hydrogen or helium is added, a large fraction of the heavier thrust gas emerges in the form of clusters. In our experiments, over 90% of carbon dioxide (mixed with hydrogen) formed clusters with typically 250 constituent molecules. These clusters can be ionized with comparably high efficiency and then accelerated electrostatically to provide thrust. Our experiments showed that additional study is needed in several areas, the most critical of which is find means to reduce the amount of carrier gas required. clusters, charged-particle beams, ion propulsion, supersonic nozzle.

DESCRIPTORS: (U) *IONS, *PROPELLANTS, *PROPULSION SYSTEMS, CHARGED PARTICLES, EFFICIENCY, ELECTRIC PROPULSION, ELECTROSTATICS, HELIUM, HYDROGEN, MASS, MOLECULES, NOZZLES, OPERATION, PARTICLE BEAMS, SUPERSONIC NOZZLES, THRUSTERS, ATOMS, CLUSTERING, IONIZATION.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A251 771

12/9

YALE UNIV NEW HAVEN CT DEPT OF COMPUTER SCIENCE

(U) New Neural Algorithms for Self-Organized Learning.

DESCRIPTIVE NOTE: Final rept. 1 Aug 89-31 Jul 91.

JUL 91

6P

PERSONAL AUTHORS: Moody, John E.

CONTRACT NO. AFOSR-89-0478

PROJECT NO. 2305

TASK NO. B3

MONITOR: AFOSR, XF
TR-92-0501, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The research performed under this grant investigated three primary areas. First, collective excitation and distributed winner-take-all dynamics were investigated in laterally connected networks to further characterize the properties of biological self-organization. Self-organization was further investigated as part of the k-means clustering algorithm, where the trade-off between learning of new exemplars and global efficiency was optimized. Finally, a cross-validation technique, referred to as Generalized Prediction Error (GPE), was investigated as a means of predicting generalization error after training.

DESCRIPTORS: (U) *ALGORITHMS, *LEARNING, *SELF ORGANIZING SYSTEMS, CLUSTERING, COMMERCE, DYNAMICS, EFFICIENCY, ERRORS, EXCITATION, GLOBAL, GRANTS, NETWORKS, ORGANIZATIONS, PREDICTIONS, TRAINING, VALIDATION, CLUSTERING, BIOLOGY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2305B3.

AD-A251 771

UNCLASSIFIED

AD-A251 770

1/1

STATE UNIV OF NEW YORK AT STONY BROOK DEPT OF APPLIED MATHEMATICS AND STATISTI CS

(U) Free Boundary Control of Markov Processes.

DESCRIPTIVE NOTE: Final rept. 1 May 88-31 Aug 91.

APR 92

9P

PERSONAL AUTHORS: Taksar, Michael

CONTRACT NO. AFOSR-88-0183

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR, XF
TR-92-0502, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The objective of this project was to further develop the theory of controlled diffusion processes and its applications. The main line of research deals with control of dissipative stochastic systems which can be viewed as a model of an aircraft under uncertain wind conditions or perturbation in the mechanical unit.

DESCRIPTORS: (U) *DIFFUSION, *BOUNDARY LAYER CONTROL, *AERODYNAMIC FORCES, AIRCRAFT, MODELS, PERTURBATIONS, THEORY, WIND, STOCHASTIC PROCESSES, STOCHASTIC CONTROL.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A1, Hamilton Jacobi Bellman equation.

AD-A251 770

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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AD-A251 768 CONTINUED

PRINCETON UNIV NJ DEPT OF MECHANICAL AND AEROSPACE
ENGINEERING

BENZENE, BUTADIENES, CHAINS, DECAY, DESTRUCTION, DIES,
DIFFUSION, FLAMES, NAPHTHALENES, OXIDATION, PROFILES,
PYROLYSIS, RATES, REGIONS, RINGS, SOOT, TEMPERATURE, TIME,
TOLUENES, WORK, XYLENES, AIR BREATHING, PROPULSION
SYSTEMS.

(U) Fuels Combustion Research.

DESCRIPTIVE NOTE: Final technical rept. 1 Oct 88-30 Sep
91.

FEB 92 40P

PERSONAL AUTHORS: Glassman, Irvin; Brezinsky, Kenneth

CONTRACT NO. AFOSR-89-0034

PROJECT NO. 2308

TASK NO. BS

MONITOR: AFOSR, XF
TR-92-0507, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Upon completion of a major study of the oxidation of benzene and its mono- and di-alkylated derivatives, a major effort was directed at the oxidation of 1-methyl naphthalene. Completed work on the xylenes indicated the oxidation of one side chain at a time before the ring is attacked. The rate of xylene decay follows a linear profile and the major intermediates detected were toluene, benzene, p-tolualdehyde, p-ethyl toluene and CO. Naphthalene, indene, phenylacetylene and benzene were found to be the major aromatic intermediates in the oxidation of 1-methyl naphthalene. The general characteristics of 1-methyl naphthalene oxidation showed that it was very much an analog of toluene. Extensive work with normal and inverse diffusion flames revealed that vinyl acetylene, allene and benzene were the key intermediates in soot formation. Experiments performed by diluting normal diffusion flames until all soot disappeared led to the conclusion that irrespective of the fuel, soot forms when the pyrolysis zone reached a specific temperature about 1700K. Fuels evaluated were acetylene, allene, ethene, benzene, 1-3 butadiene, 2butene and toluene. Soot formation and destruction processes Oxidation of aromatic fuels.

DESCRIPTORS: (U) *FUELS. *COMBUSTION, ACETYLENE, ANALOGS.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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AD-A251 738 CONTINUED

HOWARD UNIV WASHINGTON DC DEPT OF MECHANICAL ENGINEERING

(U) Dynamics and Control of Tethered Antennas/Reflectors
in Orbit.

DESCRIPTIVE NOTE: Annual rept. 1 Nov 90-31 Jan 92.

FEB 92 103P

PERSONAL AUTHORS: Bainum, Peter M.; ZhaoZhi, Tan; Zhong.
Li; Ou, Xiong X.

CONTRACT NO. F49620-90-C-0009

PROJECT NO. 2302

TASK NO. A5

MONITOR: AFOSR, XF
TR-92-0533, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) A momentum exchange controller where the time rate of change of the flexible momentum relative to the rigid body motion is used as a part of a feedback control law for maneuvers and flexible vibration suppression is introduced. This control concept is applied to: (1) a model of a rigid tug (based) with a cantilevered flexible appendage undergoing a single axis maneuver; and (2) as a component of an adaptive feedback control strategy for the retrieval of an orbiting tethered antenna/reflector system. The optimal linear quadratic Gaussian (LQG) digital control of the orbiting tethered antenna/reflector system is analyzed. The flexibility of both the antenna and the tether are included in this high order system model. With eight point actuators optimally positioned together with tether tension modulation it is seen that the degree of controllability is very high. A method of measuring tether transverse motions is proposed and is required to guarantee system observability. An analytical formulation for the modeling of the solar radiation disturbance on the tethered antenna/reflector system is introduced. A control law based on tension modulation where the gains are based on the linear quadratic regulator theory is able to maintain satisfactory pointing accuracy for low and moderate altitude orbits under the influence of solar

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pressure. For the higher altitudes a combination of tether tension modulation together with active (actuator) control will be required. Dynamics and control; Orbiting/reflector.

DESCRIPTORS: (U) *REFLECTORS, *SATELLITE ANTENNAS, *STABILITY, ACCURACY, ACTUATORS, APPENDAGES, BODIES, CONTROL, DYNAMICS, EXCHANGE, FEEDBACK, FORMULATIONS, GUARANTEES, MANEUVERS, MODULATION, MOMENTUM, MOTION, ORBITS, PRESSURE, RADIATION, RATES, REGULATORS, SOLAR RADIATION, STRATEGY, SUPPRESSION, TENSION, THEORY, TIME, TRANSVERSE, VIBRATION, ADAPTIVE CONTROL SYSTEMS, FLEXIBLE STRUCTURES, MOMENTUM TRANSFER, VIBRATION ISOLATORS, TORQUE, RADIATION PRESSURE.

IDENTIFIERS: (U) WUAFOSR2302A5, LQG(Linear Quadratic Gaussian).

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A251 707 CONTINUED

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF CHEMISTRY

Opening Metathesis Polymerization, *Vinylene, Polysiloxanes, Hydrasilation, Coupling agents.

(U) Synthesis and Characterization of poly((2-dimethylsilyl)-2-cyclopentene-1,4-diyl) Vinylene),

91 9P

PERSONAL AUTHORS: Stonich, Derek A.; Weber, William P.

CONTRACT NO. AFOSR-89-0007

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR, XF
TR-92-0478, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Polymer Bulletin, v27 p243-249 1991.
Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) Ring opening metathesis polymerization (ROMP) of 2-dimethylsilylbicyclo 2.2.1 hept (I) cocatalyzed by tungsten hexachloride/tetramethyltin yields poly (2-dimethylsilyl-2-cyclopentene-1,4-diyl) vinylene (II). This is the first example of ROMP of a monomer which contains a reactive Si-H bond. ¹H, ¹³C, ²⁹Si and IR spectroscopy were utilized to characterize II. The molecular weight distribution of II has been determined by gel permeation chromatography (GPC), its thermal stability by thermogravimetric analysis (TGA) and its glass transition temperature (Tg) by differential scanning calorimetry (DSC). Ring Opening Metathesis Polymerization (ROMP), Poly(2-dimethylsilyl-2-cyclopentene-1-4-diyl), Vinylene, Reactive Si-H bond.

DESCRIPTORS: (U) *CYCLOPENTENES, *METHYL RADICALS, CALORIMETRY, DISTRIBUTION, GELS, GLASS, MOLECULAR WEIGHT, MONOMERS, OPENINGS, RINGS, SCANNING, SPECTROSCOPY, STABILITY, THERMAL STABILITY, TRANSITIONS, TUNGSTEN WEIGHT, REPRINTS, SYNTHESIS, CATALYSIS, POLYMERS, SILICON, HYDROGEN, CHEMICAL BONDS, SILICON CARBIDES, CROSSLINKING(CHEMISTRY).

IDENTIFIERS: (U) WUAFOSR2303B2, PE61102F, *ROMP(Ring

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UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF CHEMISTRY

3-ene, n-Butyllithium, Hexamethylphosphoramide, GPC(Gel Permeation Chromatography), Inert atmosphere, Vinyl silanes, Carbanions, Silyl groups.

(U) Anionic Ring Opening Polymerization of 1-Phenyl-1-Vinyl-1-Silacyclopent-3-ene.

91 5P

PERSONAL AUTHORS: Liao, Xiugao; Leibfried, Raymond T.; Weber, William P.; Loker, D. P.; Loker, K. B.

CONTRACT NO. AFOSR-89-0007

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR, XF
TR-92-0477, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Polymer Bulletin, v26 p625-628 1991.
Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) Poly(1-phenyl-1-vinyl-1-sila-cis-pent-3-ene) (I) has been prepared by the anionic ring opening polymerization of 1-phenyl-1-vinyl-1-silacyclopent-3-ene (II) co-catalyzed by n-butyllithium and hexamethylphosphoramide (HMPA) in THF at -78 deg C. I has been characterized by ¹H, ¹³C and ²⁹Si NMR as well as by IR and UV spectroscopy. The molecular weight distribution of I has been determined by gel permeation chromatography (GPC), its thermal I stability by thermogravimetric analysis (TGA) and its glass transition temperature (T_g) by differential scanning calorimetry (DSC). Thermal degradation of I in an inert atmosphere gives a twenty-seven percent char yield. Anionic ring opening polymerization 1-phenyl-1-vinyl-1-silacyclopent-3-ene.

DESCRIPTORS: (U) *SPECTROSCOPY, *SYNTHESIS, ATMOSPHERICS, DEGRADATION, DISTRIBUTION, GELS, GLASS, MOLECULAR WEIGHT, OPENINGS, POLYMERIZATION, RINGS, STABILITY, THERMAL DEGRADATION, TRANSITIONS, WEIGHT, YIELD, REPRINTS, POLYMERS, CATALYSIS, THERMAL STABILITY.

IDENTIFIERS: (U) WUAFOSR2303B2, PE61102F, *Anionic ring opening polymerization, *1-Phenyl-1-vinyl-1-silacyclopent-

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A251 705 CONTINUED

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF CHEMISTRY

(U) Synthesis and Characterization of Poly(3,4-benzo-1-phenyl-1-silapentene) and poly(3,4-benzo-1-silapentene)

IDENTIFIERS: (U) WUAFOSR2303B2, PE61102F, *Poly(3-4-benzo-1-phenyl-1-sila pentene), *Poly(3-4-benzo-1-sila penten), Anionic ring opening polymerization, Methylolithium, End group analysis, GPC(Gel Permeation Chromatography), Polycarbosilanes.

91 7P

PERSONAL AUTHORS: Ko, Young-Hoon; Weber, William P.

CONTRACT NO. AFOSR-89-0007

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR, XF
TR-92-0475, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Polymer Bulletin, v26 p487-492 1991
Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) Low molecular weight poly(3,4-benzo-1-phenyl-1-silapentene) (I) has been prepared by anionic ring opening polymerization of 3,4-benzo-1-phenyl-1-silacyclopentene (II), co-catalyze by methylolithium and HMPA in THF at low temperature. Poly(3,4-benzo-1-silapentene) (III) has been prepared similarly by polymerization of 3,4-benzo-1-silacyclopentene (IV) except that HMPA has NOT been utilized in this latter case. I and III have been characterized by ¹H, ¹³C, and ²⁹Si NMR as well as by IR and UV spectroscopy. The low molecular weight of I and III permits end group analysis by ²⁹Si NMR. The molecular weight distributions of I and III have been determined by gel permeation chromatography (GPC) and their thermal by thermogravimetric analysis (TGA). poly(3,4-benzo-1-phenyl-1-silapentene) anionic ring opening polymerization poly(3,4-benzo-1-silapentene).

DESCRIPTORS: (U) *SPECTROSCOPY, *SYNTHESIS, GELS, LOW TEMPERATURE, MOLECULAR WEIGHT, OPENINGS, POLYMERIZATION, RINGS, TEMPERATURE, WEIGHT, REPRINTS, PHENYL RADICALS, BENZYL RADICALS, CATALYSIS, THERMAL STABILITY, POLYMERS, SILICON, HYDROGEN, DECOMPOSITION, SILICON CARBIDES.

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PITTSBURGH UNIV PA DEPT OF CHEMISTRY

AD-A251 704 CONTINUED

TEMPERATURE, THERMAL STABILITY, REPRINTS, CHEMICAL DISSOCIATION, MOLECULAR BEAMS, ACTIVATION.

(U) Vibrational Studies of CH₃I on Si(100)-(2x1): Adsorption and Decomposition of the Methyl Species.

IDENTIFIERS: (U) WUAFOSR2303A2, PE61102F, *Methyl iodide, HREELS(High Resolution Electron Energy Loss Spectroscopy), Multilayers.

APR 92 9P

PERSONAL AUTHORS: Colaianni, M. L.; Chen, P. J.; Gutleben, H.; Yates, J. T., Jr

CONTRACT NO. AFOSR-89-0364, F49620-84-C-0063

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR, XF
TR-92-0472, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Chemical Physics Letters, v191 n6 p561-568, 17 Apr 92. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) The dissociative adsorption of CH₃I to adsorbed CHI and I on a clean Si(100)-(2x1) surface has been studied by high resolution electron energy loss spectroscopy (HREELS), temperature programmed desorption (TPD) and Auger electron spectroscopy (AES). The thermal stability of CH₃(a)-to 600 has been witnessed spectroscopically. At higher temperatures, CH₃(a) decomposes to CH(a), possibly via the production of intermediate -CH₂(a) species. The CH(a) species is stable to 800 K. HREELS and TPD show that following CH₃I dissociative adsorption at 100 K, a multilayer of undissociated CH₃I is condensed on the substrate. Upon heating this condensed overlayer is desorbed with a peak temperature of 225 K. H₂ and I desorption occur near 785 K, leaving adsorbed carbon on the Si(100) surface. Methyl Carbon Silicon Methyl Iodide.

DESCRIPTORS: (U) *ADSORPTION, *SILICON, *VIBRATIONAL SPECTRA, *DECOMPOSITION, AUGER ELECTRON SPECTROSCOPY, AUGER ELECTRONS, AUGERS, CARBON, DESORPTION, ELECTRON ENERGY, ELECTRON SPECTROSCOPY, ELECTRONS, ENERGY, HEATING, HIGH RESOLUTION, IODIDES, PRODUCTION, RESOLUTION, SPECTROSCOPY, STABILITY, SUBSTRATES, SURFACES.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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OKLAHOMA STATE UNIV STILLWATER DEPT OF BIOCHEMISTRY

(U) Nonstatistical Effects in Bond Fission Reactions of 1, 2-difluoroethane.

AUG 91 10P

PERSONAL AUTHORS: Schranz, Harold W.; Raff, Lionel M.; Thompson, Donald L.

CONTRACT NO. AFOSR-89-0085

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR, XF
TR-92-0450, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Chemical Physics Letters, v182 n5 p455-462, 9 Aug 91. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) A microcanonical, classical variational transition-state theory based on the use of the efficient microcanonical sampling (EMS) procedure is applied to simple bond fissions in 1,2-difluoroethane. Comparison is made with results of trajectory calculations performed on the same global potential-energy surface. Agreement between the statistical theory and trajectory results for C-C, C-F and C-H bond fissions is poor with differences as large as a factor of 125. Most importantly, at the lower energy studied, 6.0 eV, the statistical calculations predict considerably slower rates than those computed from trajectories. We conclude from these results that the statistical assumptions inherent in the transition-state theory method are not valid for 1,2-difluoroethane in spite of the fact that the total intramolecular energy transfer rate out of C-H and C-C normal and local modes is large relative to the bond fission rates. The IVR rate is not globally rapid and the trajectories do not access all of the energetically available phase space uniformly on the timescale of the reactions.

DESCRIPTORS: (U) *FLUORINATED HYDROCARBONS, *VARIATIONAL

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PRINCIPLES, *FISSION, TRAJECTORIES, POTENTIAL ENERGY, REPRINTS, SURFACES, CARBON, FLUORINE, HYDROGEN, LOW ENERGY, MOLECULAR ENERGY LEVELS, POLYATOMIC MOLECULES, COEFFICIENTS, RATES.

IDENTIFIERS: (U) WUAFOSR230383, PE61102F,
*Nonstatistical effects, Bond fission reactions,
EMS(Efficient Microcanonical Sampling).

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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TUSKEGEE UNIV AL

systems.

(U) Component Model Reduction in Flexible Multibody Systems.

DESCRIPTIVE NOTE: Final rept. May 89-30 Apr 91.

OCT 91 15P

PERSONAL AUTHORS: Eke, Fidelis O.; Eke, Estelle M.

CONTRACT NO. F49620-89-C-0081

PROJECT NO. 2302

TASK NO. AS

MONITOR: AFOSR, XF
TR-92-0346, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The use of multibody simulation programs for the study of large displacement motions of systems of flexible bodies adds another dimension to the model reduction problem. In general, straightforward criteria are available for performing model reduction at the system level; however, simulation codes normally require modal data input for each component body of a system rather than for the system as a whole. It is thus always necessary to determine the modes to be retained for each component based on knowledge of the system modes of interest. The method presented in this report for component model reduction utilizes submatrices of the system modal matrix as transformation matrices used to accomplish the first phase of a two phase matrix diagonalization process. This method is systematic and, as demonstrated above using simple mass-spring systems, the method gives very accurate results. The method has also been tested on a model of the Galileo spacecraft, and gave excellent results. Component Model Reduction, Multibody Simulation.

DESCRIPTORS: (U) *FLEXIBLE STRUCTURES, *COMPUTERIZED SIMULATION, BODIES, DISPLACEMENT, INPUT, MASS, MODELS, PHASE, REDUCTION, SIMULATION, SPACECRAFT, TRANSFORMATIONS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2302AS, *Military

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OPTICAL SOCIETY OF AMERICA WASHINGTON DC

BERKELEY APPLIED SCIENCE AND ENGINEERING INC SAN FRANCISCO CA

- (U) Organization of the Optical Society of America
 Photonic Science Topical Meeting Series 1991.
 Nonlinear Guided-Wave Phenomena Held in Cambridge,
 England United Kingdom on September 2-4, 1991.

DESCRIPTIVE NOTE: Final rept. 1 Jan-31 Dec 91,

MAY 92 57P

PERSONAL AUTHORS: Quinn, Jarus W.

CONTRACT NO. AFOSR-91-0176

PROJECT NO. 2305

TASK NO. A1

MONITOR: AFOSR, XF
 TR-92-0510, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Attach list of reports supported by Optical Society of America: Photorefractive Materials, Effects, and Devices; Integrated Photonics Research; Nonlinear Guided Wave Phenomena; Optical Amplifiers and Their Applications; Optical computing; Picosecond Electronics and Optoelectronics; Quantum Optoelectronics; Photonic Switching; Microphysics of Surfaces: Beam Induced Processes; Soft X-ray Projection Lithography; Short Wavelength Coherent Radiation, Generation and Application; and Persistent Spectral Hole-Burning; Science and Applications.

DESCRIPTORS: (U) *SOLITONS, *PHOTONICS, ALUMINUM GALLIUM ARSENIDES, QUANTUM ELECTRONICS, ENERGY GAPS, HETEROJUNCTIONS, FIBER OPTICS TRANSMISSION LINES, DOPING, ERBIUM, TWO PHOTON ABSORPTION, GERMANIUM, PULSED LASERS, REPETITION RATE, OPTICAL SWITCHING, ANALOG TO DIGITAL CONVERTERS, DIGITAL TO ANALOG CONVERTERS, OPTICAL CIRCUITS.

IDENTIFIERS: (U) WUAFOSR2305A1, Quantum wells, Second harmonic Generation, Femtosecond time, Optical computing.

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- (U) Development of an Advanced Continuum Theory for Composite Laminates. Phase 2, Annual Report. Volume 2 (Attachments).

DESCRIPTIVE NOTE: Annual technical rept. 1 Jan 92-1 Jan 92,

MAR 92 279P

PERSONAL AUTHORS: Panahandeh, M.; Ghanimati, G. R.

CONTRACT NO. F49620-91-C-0019

PROJECT NO. 2302

TASK NO. BS

MONITOR: AFOSR, XF
 TR-92-0535, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) A continuum theory with a micro-macro structure was developed for composite laminates that satisfies the traction and displacement continuity requirements at interfaces. The interlaminar stresses were included in the model in a natural way and without any ad hoc assumptions. The theory is best suited for thick multi-constituent laminates composed of several thin plies. The built-in micro-structure of the continuum model can account for the effects of curvature and geometric nonlinearity. A set of constitutive relations in terms of material properties of individual constituents was developed which is capable of modeling fiber orientation and stacking sequence. The theory was further expanded to include the effects of temperature where a set of coupled thermo-mechanical field equations with corresponding constitutive relations were derived. The field equations for linearized kinematics and flat geometries were obtained. Development of the theory for cylindrical and spherical geometries is underway. Composite laminates, thick composites, micro-structure, interlaminar stress, constitutive relations, thermo mechanical.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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AD-A251 642 12/9 12/7 8/2

DESCRIPTORS: (U) *LAMINATES, *FIBER REINFORCED COMPOSITES, *CONTINUUM MECHANICS, CONTINUITY, CURVATURE, DISPLACEMENT, EQUATIONS, FIBERS, INTERFACES, KINEMATICS, MATERIALS, MODELS, REQUIREMENTS, SEQUENCES, STACKING, STRESSES, TEMPERATURE, THEORY, TRACTION, COMPOSITE MATERIALS, MICROSTRUCTURE, THERMOMECHANICS, TRANSFORMATIONS(MATHEMATICS).

CARNEGIE-MELLON UNIV PITTSBURGH PA

(U) The Acquisition and Utilization of Spatial and Functional Knowledge for Imagery Analysis.

DESCRIPTIVE NOTE: Final rept. 1 Dec 88-30 Nov 91.

MAR 91 42P

IDENTIFIERS: (U) WUAFOSR2302BS, Macrostructure.

PERSONAL AUTHORS: McKeown, David M., Jr

CONTRACT NO. AFOSR-89-0199

PROJECT NO. 2304

TASK NO. A7

MONITOR: AFOSR, XF
TR-92-0561, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) In December 1988, researchers at the Digital Mapping Laboratory, School of Computer Science at Carnegie-Mellon University began work on a 30 month contract to explore the acquisition and utilization of spatial and functional knowledge for imagery analysis. Over the course of this grant, they have built on previous research in large-scale knowledge-based systems for the interpretation of aerial imagery. This previous work has focused on the automated analysis of airports and Suburban house scenes. Under this grant they have also addressed issues in knowledge acquisition, analysis and evaluation of system performance, and task-level parallelism for large-scale production systems.

DESCRIPTORS: (U) *AERIAL PHOTOGRAPHY, *MAPPING, *IMAGE PROCESSING, *COMPUTER GRAPHICS, ACQUISITION, AIRPORTS, COMPUTERS, CONTRACTS, FORMICIDAE, GRANTS, KNOWLEDGE BASED SYSTEMS, LABORATORIES, PRODUCTION, SCALE, SCHOOLS, UNIVERSITIES, UTILIZATION, WORK, OPTICAL IMAGES, ARTIFICIAL INTELLIGENCE, COMPUTER ARCHITECTURE.

IDENTIFIERS: (U) PE62301E, WUAFOSR2304A7, SPAM
Architecture, Ground truth.

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VIRGINIA POLYTECHNIC INST AND STATE UNIV BLACKSBURG DEPT
OF COMPUTER SCIENCE

CITY COLL NEW YORK DEPT OF MATHEMATICS

(U) Homotopy Methods in Control System Design and Analysis.

(U) On the Reliability of Systems Subject to Maintenance
and Repair.

DESCRIPTIVE NOTE: Final rept. 1 Sep 89-30 Apr 92.

DESCRIPTIVE NOTE: Final rept. 15 Nov 88-14 Feb 92.

APR 92 21P

APR 92 6P

PERSONAL AUTHORS: Watson, Layne T.

PERSONAL AUTHORS: Brown, Mark

CONTRACT NO. AFOSR-89-0497

CONTRACT NO. AFOSR-89-0083

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A1

TASK NO. A5

MONITOR: AFOSR, XF
TR-92-0505, AFOSR

MONITOR: AFOSR, XF
TR-92-0503, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The primary objective of this research is to extend and develop homotopy algorithms for a variety of computational problems in control. In addition, these problems are being examined in the context of the algebraic and differential geometry on which the homotopy methods are based. This will enable the classification of solutions to a particular problem and consequently will allow the analyst or designer to extract the most desirable solution.

ABSTRACT: (U) Substantive results were attained in applying distributions to reliability estimates and maintenance measures. A number of articles in national journals on topics such as Simultaneous Confidence in Levels and Goodness of Fit for Failure Rates.

DESCRIPTORS: (U) *ALGEBRAIC TOPOLOGY, *ALGORITHMS, ADDITION, ANALYSTS, CLASSIFICATION, CONTROL, DIFFERENTIAL GEOMETRY, GEOMETRY.

DESCRIPTORS: (U) *MAINTENANCE, ESTIMATES, FAILURE, NUMBERS, RELIABILITY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A1.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5.

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AD-A251 635 CONTINUED

MARYLAND UNIV COLLEGE PARK DEPT OF MECHANICAL
ENGINEERING

VELOCITY, EXPLOSIVE FORMING.

(U) Mechanisms of Fracture and Fragmentation by Explosive
Loading. IDENTIFIERS: (U) PE61102F, WJAFDSR2302C2, *Explosive
loading.

DESCRIPTIVE NOTE: Final rept. 1 Aug 88-31 Jul 91.

APR 92 188P

PERSONAL AUTHORS: Dick, Richard D.; Fournery, William L.;
Wang, Xiang J.; Young, Chapman, III; Wei, Youzhi

CONTRACT NO. AFOSR-88-0280

PROJECT NO. 2302

TASK NO. C2

MONITOR: AFOSR, XF
TR-92-0508, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The research reported here involved a study to answer some fundamental questions on the mechanisms of rock fracture and fragmentation by explosive loading. The program was experimental and dealt with the dynamic event as a three dimensional problem. Specifically, small scale models were used to obtain dynamic behavior of the model materials by measuring strain, stress, and particle velocity during the explosive event. Dynamic photoelastic methods were used to obtain data on the fracture patterns, propagation speeds, and sequences involved in the process. The effects of small flaws, large joints and discontinuities, and explosive source geometry were studied. The findings are: (1) At early times, shock wave effects promote fracture initiation, coalescence and branching in the matrix material. At later times, the explosive gas pressure causes the cracks to extend and fragments to form. Fracture, Fragmentation, Explosive Loading

DESCRIPTORS: (U) *FRAGMENTATION, BEHAVIOR, COALESCENCE, CRACKS, DISCONTINUITIES, DYNAMICS, EXPLOSIVES, FRAGMENTS, GEOMETRY, MATERIALS, MATRIX MATERIALS, MODELS, PARTICLES, PATTERNS, PRESSURE, PROPAGATION, ROCK, SCALE, SCALE MODELS, SEQUENCES, SHOCK, SHOCK WAVES, THREE DIMENSIONAL.

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KANSAS STATE UNIV MANHATTAN DEPT OF CHEMISTRY

(U) State Resolved Chemistry of NF, PF, and N3.

DESCRIPTIVE NOTE: Final rept.,

MAY 92 15P

PERSONAL AUTHORS: Setser, Donald W.

REPORT NO. 5-30173

CONTRACT NO. AFOSR-88-0279

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR, XF
TR-92-C506, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Experimental methods were developed to study the chemical kinetics of NF(XSigma-), NF(a1Delta), and NF(b1Sigma+) molecules in a gas phase flow reactor. Since the F + NCO and F + N₂ reactions were used to produce the NF(X) and NF(a) molecules, respectively, experiments also were done to characterize N3 and NCO radicals by laser induced fluorescence. With the exception of the halogens, most stable molecules quench NF(b) by a physical, E - V quenching mechanism. In contrast, the NF(a) state seems to interact with most molecules by a chemical mechanism. Neither NF singlet state is highly reactive at room temperature, and NF(a) and NF(b) are good molecules for energy storage. The interaction of NF(a) with 2, ICI and iP resembles that for O2(a1Delta). The first step is rapid E - V transfer, which is followed by utilization of a second NF(a) molecule giving I atoms. The concentrations of NF(a) and NF(b) were monitored by their fluorescence intensities. The NF(X-) concentration was observed by the N2(A) + NF(X) excitation-transfer reaction. NF(XSigma-), NF(a1Delta), NF(b1Sigma+), Reaction rates, Metastable states, Energy storage, Flow reactor kinetics.

DESCRIPTORS: (U) *ENERGY STORAGE, *LASER INDUCED FLUORESCENCE, *REACTION KINETICS, *NITROGEN, *FLUORINE.

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*PHOSPHORUS, ATOMS, CHEMICALS, CONTRAST, ENERGY, EXCITATION, FLOW, FLUORESCENCE, HALOGENS, INTERACTIONS, KINETICS, LASERS, MOLECULES, PHASE, QUENCHING, RATES, REACTOR KINETICS, ROOM TEMPERATURE, STORAGE, TEMPERATURE, TRANSFER, UTILIZATION, METASTABLE STATE.

IDENTIFIERS: (U) PEG1102F, WUAFOSR230381, *State resolved chemistry, Flow reactor kinetics, Gas phase.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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AD-A251 608 CONTINUED

FLORIDA UNIV GAINESVILLE QUANTUM THEORY PROJECT

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B3, *Energetics, *Tetraazatetrahedrane, *Hexaazabenzene, *Octaazacubane, Tetrahedral, MBPT(Many Body Perturbation Theory), SCF(Self-Consistent-Field), Coupled clusters, Ab initio, Unimolecular dissociation, Vibrational frequencies, Atomic arrangements.

(U) Stability and Energetics of Metastable Molecules: Tetraazatetrahedrane (N4), Hexaazabenzene (N6) and Octaazacubane (N8).

92

7P

PERSONAL AUTHORS: Lauderdale, Walter J.; Stanton, John F.; Bartlett, Rodney J.

CONTRACT NO. AFOSR-89-0207

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR. XF
TR-92-0435, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in The Jnl. of Physical Chemistry, v96 n3 -1173-1178 1992. Available only to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) By use of ab initio self-consistent field (SCF), coupled-cluster, and -many-body perturbation theory (MBPT) methods, the potential nitrogen molecules, tetrahedral N4 and octahedral N8, are found to be metastable, corresponding to local minima on their respective potential energy surfaces. Barriers to unimolecular dissociation appear to be large enough that the unknown molecules could be formed. Three additional N4 structures (Cs, C2v, and D2h) are also found. Vibrational frequencies are computed at the MBPT(2) level to aid in the identification of these unknown molecules. Similar analysis of the N6 analogue of benzene demonstrates, unambiguously, that even though hexaazabenzene is a local minimum at the SCF level, at the correlated level it is a second-order saddle point of the N6 surface. Metastable, ab initio, MBPT, tetrahedral.

DESCRIPTORS: (U) *BENZENE, *MOLECULES, *NITROGEN, *METASTABLE STATE, BARRIERS, BODIES, DISSOCIATION, ENERGY, IDENTIFICATION, PERTURBATIONS, POTENTIAL ENERGY, SURFACES, REPRINTS, STABILITY, THERMODYNAMICS, ATOMS.

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AD-A251 607 CONTINUED

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF
CHEMISTRY

(U) Synthesis and Reactivity of Cyclotriposphazenes
Bearing Reactive Silane Functionalities: Novel
Derivatives via Hydrosilylation Reactions.

91 8P

PERSONAL AUTHORS: Allcock, Harry R.; Nelson, Constance J.;
Coggio, William D.

CONTRACT NO. AFOSR-89-0234

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR. XF
TR-92-0436, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Organometallics, v10 n11 p3819-3825
1991. Available only to DTIC users. No copies furnished
by NTIS.

ABSTRACT: (U) Cyclotriposphazenes with the general
structure $N_3P_3(OPh)_3$, $SNH(CH_2)_3SiMe_2OEt$ react with lithium
aluminum hydride in diethyl ether to produce $N_3P_3(OPh)_3$.
 $SNH(CH_2)_3SiMe_2H$. Subsequent reaction of this species with
alkenes in the presence of a platinum catalyst produced
new cyclotriposphazenes bearing alkoxy, silyloxy, glycidyl,
and ferrocenyl side groups. The yields depended on the
type of catalyst and olefin used. Tetramethyl-1,3-
divinyl-disiloxane-platinum complex (DVDS:Pt) was a more
efficient hydrosilylation catalyst than hydrogen
hexachloroplatinic acid (CPA). Use of the latter catalyst
yielded the silanol $N_3P_3(OPh)_3SNH(CH_2)_3SiMe_2OH$, as a side
product. This derivative subsequently condensed to
produce a ring-linked phosphazene species. The
hydrosilylation products were studied by ^{31}P , 1H , and ^{13}C
NMR and infrared spectroscopy, elemental analysis, and
mass spectrometry. Analogous reactions were investigated
with the high-polymeric counterparts. Polymers with the
general structure $NPR_1.8(NH(CH_2)_3SiMe_2OEt)_0.2In$, where R
is $-OCH_2CF_3$ or $-OC_4H_9$, were synthesized and allowed to
react with $LiAlH_4$. The reduction process induced

significant molecular weight decline from phosphorus-
nitrogen bond cleavage, which was probably initiated by
coordination of the aluminum to the nitrogen atoms in the
polymer backbone and the amino side group. The influence
of complexing agents, such as 4-(dimethylamino)pyridine
(DMAP) and Et_3N , on the reduction reactions was
investigated. Organometallic, Phosphazenes, Synthesis.

DESCRIPTORS: (U) *INFRARED SPECTROSCOPY, *MOLECULAR
WEIGHT, *SYNTHESIS, *SILANES, *ORGANIC COMPOUNDS, ALKENES,
ALUMINUM, ATOMS, BEARINGS, CATALYSTS, CLEAVAGE, ETHERS,
HYDRIDES, HYDROGEN, LITHIUM, MASS, MASS SPECTROMETRY,
NITROGEN, PHOSPHAZENE, PHOSPHORUS, PLATINUM, POLYMERS,
REDUCTION, RINGS, SPECTROMETRY, SPECTROSCOPY, STRUCTURES,
WEIGHT, REPRINTS.

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SEARCH CONTROL NO. T85005

AD-A251 598

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ARIZONA STATE UNIV TEMPE CENTER FOR SOLID STATE
ELECTRONICS RESEARCH(U) Design and Training of Limited-Interconnect
Architectures.

DESCRIPTIVE NOTE: Final rept. 1 Jun 89-31 May 91,

JUL 91 6P

PERSONAL AUTHORS: Akers, Lex A.; Walker, Mark R.;
Haghighi, Starnack

REPORT NO. DWA-1752

CONTRACT NO. AFOSR-89-0430

PROJECT NO. 2305

TASK NO. B3

MONITOR: AFOSR, XF
TR-92-0504, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This DRAFT Final Report describes the progress on the AFOSR research contract on the design and training of limited-interconnect neural architectures. A novel local training rule has been derived, an information theoretic analysis to determine capabilities and limitations of multi-layered limited-interconnect neural networks was developed, and the hardware implementation of local training rules analyzed. Neural Networks, Information Theory.

DESCRIPTORS: (U) *NEURAL NETS, *INTEGRATED CIRCUITS, CONTRACTS, INFORMATION THEORY, LIMITATIONS, NETWORKS, THEORY, TRAINING.

IDENTIFIERS: (U) PE61102F, WUAFOSR2305B3.

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COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

(U) Photochemistry of Macrocyclic Ketones within Zeolites:
Competition between Norrish Type I and Type II
Reactivity.

91 5P

PERSONAL AUTHORS: Ramamurthy, V.; Lei, X. G.; Turro, N. J.;
Lewis, J. T.; Scheffer, J. R.

CONTRACT NO. AFOSR-91-0340

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR, XF
TR-92-0495, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Tetrahedron Letters, v32 n52 p7675-7678 1991. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) Photolysis of macrocyclic mono- and diketones (1 and 2.) included in X and Y zeolites gives Norrish type I products in addition to the products obtained via the Norrish type II process, the only observed process in isotropic media. Enhancement of the type I over the type II process is cation dependent and especially large enhancements are obtained with Li and Na as cations. The zeolite effect is attributed to a reduction in the rate of the Norrish type II tau-hydrogen abstraction process. Zeolites.

DESCRIPTORS: (U) *PHOTOLYSIS, *KETONES, ADDITION, AUGMENTATION, CATIONS, HYDROGEN, MEDIA, RATES, REDUCTION, REPRINTS, LITHIUM, SODIUM.

IDENTIFIERS: (U) WUAFOSR2303B2, PE61102F,
*Photochemistry, *Macrocyclic, *Zeolites, *Norrish reactivities, Cycloalkanones, Alpha cleavage, Ring systems.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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JOHNS HOPKINS UNIV BALTIMORE MD

AD-A251 577 CONTINUED

(U) On the Mechanism of the Reaction $\text{CH}(X\ 2\ \text{Pi}) + \text{N}_2(X\ 1\ \text{Sigma}^+) \rightarrow \text{sub g yields HCN}(X\ \text{a Sigma}^+) + \text{N}(4\text{S})$. I: A Theoretical Treatment of the Electronic Aspects of the Intersystem Crossing,

AUG 91 11P

PERSONAL AUTHORS: Manaa, M. R.; Yarkony, David R.

CONTRACT NO. AFOSR-90-0051

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR, XF
TR-92-0498, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Chemical Physics, v95 n3 p1807-1816, 1 Aug 91. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) The reaction $\text{CH}(X\ 2\ \text{Pi}) + \text{N}_2(X\ 1\ \text{Sigma}^+ \text{ sub g}) \rightarrow \text{HCN}(X\ 1\ \text{Sigma}^+) + \text{N}(4\text{S})$ has been suggested as the initial step in the formation of 'prompt' NO in flame fronts. Since the reaction is spin-forbidden an intersystem crossing must occur in the vicinity of the allowed crossing hypersurface of the lowest doublet and quartet potential energy surfaces. In this work the electronic structure aspects to this intersystem crossing are considered using multireference configuration interaction wavefunctions. Key to this treatment is a new implementation of a constrained analytic gradient search algorithm which is used to locate regions of the doublet-quartet crossing hypersurface. In those regions of nuclear coordinate space the spin-orbit coupling (matrix elements of H_{SO}) is determined using the full microscopic Breit-Pauli spin-orbit interaction (that is both the spin-orbit and spin-other-orbit contributions are included). Included in this treatment are the largest configuration state function expansions, 700,000-900,000 terms, used to date to evaluate matrix elements H_{SO} within the full Breit-Pauli approximation. Our conclusions are as follows. The lowest energy point on the doublet-quartet crossing

hypersurface corresponds, approximately, to a $\text{C}2\text{v}$ nuclear configuration in which the HC moiety has inserted into a highly stretched N_2 bond. The spin-orbit coupling in this region is approximately 12cm^{-1} . This region is estimated to be endoergic with respect to the reactant channel asymptote by approximately 7.5kcal/mol . A second region of the crossing hypersurface corresponds to a perturbed nitrogen atom collinearly adjacent to the nitrogen side of the HCN moiety which is in its ground electronic state.

DESCRIPTORS: (U) *HYDROGEN CYANIDE, CONFIGURATIONS, COORDINATES, COUPLINGS, CROSSINGS, ELECTRONIC STATES, ELECTRONICS, EXPANSION, FLAMES, GRADIENTS, INTERACTIONS, NITROGEN, ORBITS, POTENTIAL ENERGY, STRUCTURES, SURFACES, REPRINTS.

IDENTIFIERS: (U) Intersystem crossing, Nitrogen oxide, Reaction mechanisms.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A251 562 5/8

COGNITIVE SYSTEMS INC NEW HAVEN CT

(U) Case Based Reasoning for Tactical Planning.

DESCRIPTIVE NOTE: Final rept. 1 Apr 88-31 Oct 91,

OCT 91 6P

PERSONAL AUTHORS: Goodman, Marc

CONTRACT NO. F49620-88-C-0058

PROJECT NO. 6227

TASK NO. 00

MONITOR: AFOSR, XF
TR-92-0554, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Over the course of the three year contract on CBR, Cognitive has focused on designing and building a commercial-quality Case-Based Reasoning shell. They have addressed issues in the methodology for building case-based applications, appropriate and useful interfaces and functionality for representing, indexing, retrieving, and adapting cases, and have proven the usefulness of the technology by constructing specific applications and comparing their performance to corresponding applications built with other techniques.

DESCRIPTORS: (U) *REASONING, *COGNITION, BUILDINGS, CONTRACTS, INTERFACES, METHODOLOGY, QUALITY.

IDENTIFIERS: (U) PE61102F, WUAFOSR622700, CBR(Case Based Reasoning).

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MISSOURI UNIV-COLUMBIA DEPT OF CIVIL ENGINEERING

(U) Monoclonal Antibody Detection of Chlorinated Benzenes on Contaminated Sediments.

DESCRIPTIVE NOTE: Annual technical rept. 1 May 91-30 Apr 92,

MAY 92 11P

PERSONAL AUTHORS: Mossman, Deborah J.; Feldbush, Thomas L.

CONTRACT NO. AFOSR-91-0236

PROJECT NO. 3484

TASK NO. RS

MONITOR: AFOSR, XF
TR-92-0552, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) A modification to allow direct testing of soils and sediments has been made to the standard immunoassay procedure. The modified procedure eliminates the need for extraction prior to ELISA testing. The new method has been successfully tested using 2,4-dinitrobenzene sulfonate as the model pollutant and crushed, sieved brick chips as the model soil matrix. The modified ELISA is very sensitive and easily distinguishes between contamination levels. Monoclonal antibodies are being produced to three chlorobenzenes (chlorobenzene, 1,2-dichlorobenzene, 1,3-dichlorobenzene). In vitro cell culturing has produced antibodies to 4-chloroaniline (analog for chlorobenzene). The antibodies to the chlorobenzenes will be used to demonstrate the modified ELISA with a pollutant of interest and actual soil matrices. Immunoassay, sediment testing, ELISA.

DESCRIPTORS: (U) *CONTAMINATION, *IMMUNOASSAY, *MONOCLONAL ANTIBODIES, *SULFONATES, ANTIBODIES, BRICK, EXTRACTION, MODELS, MODIFICATION, POLLUTANTS, SEDIMENTS, SOILS, STANDARDS.

IDENTIFIERS: (U) PE61103D, WUAFOSR3484RS, ELISHA(Enzyme Linked Immunosorbent Blocking Assay), Immunochemistry

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ROCHESTER UNIV NY DEPT OF CHEMISTRY

AMERICAN CHEMICAL SOCIETY WASHINGTON DC

(U) Solvation Structure in the Time Resolved Stokes Shift
and Adiabatic Electron Transfer.

(U) Organic and Nonlinear Optical Materials Symposium.

DESCRIPTIVE NOTE: Final rept. 1 Sep 89-31 Aug 90.

91 7P

MAY 92 7P

PERSONAL AUTHORS: Fried, Laurence E.; Mukamel, Shaul

PERSONAL AUTHORS: Williams, David J.

CONTRACT NO. AFOSR-90-0054

CONTRACT NO. AFOSR-89-0452

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. B3

TASK NO. A3

MONITOR: AFOSR, XF

TR-92-0493, AFOSR

MONITOR: AFOSR, XF

TR-92-0562, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

Availability: Pub. in Molecular Crystals and Liquid Crystals, v194 p263-268 1991. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) There is an important connection between the time resolved Stokes shift of a chromophore in a polar solvent and the dynamical contribution to electron transfer reactions. We present a microscopic theory of the time resolved Stokes shift of a chromophore in a polar solvent which incorporates both non-Debye dielectric relaxation and solvation shell structure, then apply it to the Sparragione-Mukamel theory of electron transfer reactions. We find that molecular effects can dramatically affect the rate of reaction. Moreover, we find that when translational motion is fast compared to rotational motion, dielectric continuum theory gives a good approximation to the reaction rate. Four wave mixing and solvation dynamics, Stokes shift, femtosecond spectroscopy.

DESCRIPTORS: (U) *CHROMOPHORES, *REACTION KINETICS, *SOLVATION, DIELECTRICS, DYNAMICS, ELECTRON TRANSFER, MIXING, MOTION, RATES, RELAXATION, SOLVENTS, SPECTROSCOPY, STRUCTURES, THEORY, TIME, REPRINTS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR230383, Stokes shift.

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ABSTRACT: (U) The premise for the conference was the photonics is an emerging technology physics, chemistry, optics, and materials science for optical information and signal transmission and processing. The materials and phenomena of interest enable a variety of functions including optical frequency and amplitude modulation, parametric processes such as frequency conversion and amplification, switches between signal paths, analogue and digital computing functions, and a variety of signal processing functions. The conference was organized into the following topical areas: (1) second order nonlinear optics - materials, design, synthesis, fabrication, characterization, and processing into device structures. (2) third order nonlinear optics - fundamental mechanisms, materials, processing, applications, devices. (3) polymers in fiber optics - cladding, guiding, properties, applications. (4) molecular assembly approaches - Langmuir Blodgett and molecular self assembly as a means of controlling thin film architecture. (5) polymers in microensors.

DESCRIPTORS: (U) *SYMPOSIA, PHYSICS, CHEMISTRY, OPTICS, NONLINEAR OPTICS, MATERIALS HANDLING, POLYMERS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303A3, Conferences.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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GEORGIA UNIV ATHENS DEPT OF PHARMACOLOGY AND TOXICOLOGY

drinking water contamination.

(U) Bioavailability of Volatile Organics and Other Hydrocarbons from Environmental Media: Ingestion in Drinking Water.

DESCRIPTORS: (U) *DRINKING WATER, CONTAMINATION, DOSAGE, ELIMINATION, INGESTION(PHYSIOLOGY), LIVER, LUNG, LYMPHATIC SYSTEM, PHARMACOKINETICS, TOXICITY, AVAILABILITY.

DESCRIPTIVE NOTE: Final rept. 15 Aug 88-14 Aug 91.

IDENTIFIERS: (U) PE61102F, WUAFOSR2312A4, *Volatile organic compounds, *Bioavailability, Presystemic elimination, Hepatotoxicity.

MAY 92 20P

PERSONAL AUTHORS: Bruckner, James V.

CONTRACT NO. AFOSR-88-0277

PROJECT NO. 2312

TASK NO. A4

MONITOR: AFOSR, XF
TR-92-0509, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The primary objectives of this project were to: (a) assess the roles of hepatic and pulmonary presystemic elimination in reducing the bioavailability of low levels of volatile organic chemicals (VOCs) found in drinking water supplies; (b) investigate gastrointestinal (GI) absorption pathways for VOCs; (c) characterize the influence of oil dosage vehicles on the absorption, pharmacokinetics (PK) and toxicity of VOCs, with emphasis on potential mechanisms by which corn oil acts. Substantial progress has been made towards achieving each of these objectives. Studies in unanesthetized, male Sprague-Dawley rats, contrasting the PK of equal doses of VOCs given orally as a single bolus and by constant intragastric (ig) infusion for up to 6 hours, revealed significantly lower peak blood levels and bioavailability in the ig groups. Blood concentrations of well metabolized VOCs, such as trichloroethylene (TCE) and 1,1-dichloroethylene, were so low that they were hardly detectable at low dosage levels in the ig animals. These findings suggest that the liver and lungs may be able to remove virtually all of the trace amounts of VOCs that are usually found in drinking water. Volatile organic chemicals (VOCs), Bioavailability, pharmacokinetics, presystemic elimination, absorption, lymphatic system, hepatotoxicity, dosage vehicles.

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ILLINOIS UNIV AT CHICAGO CIRCLE DEPT OF CIVIL ENGINEERING
MECHANICS AND METALL URGY

CALIFORNIA UNIV LOS ANGELES DEPT OF CIVIL ENGINEERING

(U) Nonlinear Waves in Solids Generated by Impact.

(U) The Micromechanic Theory of Constitutive Relations of Polycrystalline Solids.

DESCRIPTIVE NOTE: Final rept. 15 Oct 88-14 Oct 91,

DESCRIPTIVE NOTE: Final rept. 1 Nov 88-31 Oct 91,

JAN 92 42P

DEC 91 46P

PERSONAL AUTHORS: Ting, T. C.

PERSONAL AUTHORS: Lin, T. H.

CONTRACT NO. AFOSR-89-0013

CONTRACT NO. AFOSR-89-0096

PROJECT NO. 2302

PROJECT NO. 2302

TASK NO. C2

TASK NO. B1

MONITOR: AFOSR, XF

MONITOR: AFOSR, XF

TR-92-0529, AFOSR

TR-92-0531, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The final report summarizes contributions of research supported by the project. There are three main areas: (1) Classification of 2x2 non-strictly hyperbolic systems. (2) Wave curves with the presence of an umbilic point and an umbilic line. (3) The generalized Riemann problem. The results are of general nature that they are applicable not only to nonlinear isotropic elastic solids but also to other areas such as the oil recovery problems. Shock waves, wave curves, Riemann problems, non-strictly hyperbolic systems, conservation laws.

ABSTRACT: (U) This research is to derive the macroscopic multi-axial stress-strain and stress-strain-time relations of metals from those of the component crystals. Since the macroscopic stress-strain relation depends on the grain size, the component crystal properties are also dependent on grain size. Hence the component crystal stress-strain relation is here derived from the uniaxial polycrystal tests. This automatically takes care of the grain size effect. The same approach is used to derive the macroscopic stress-strain-time relation (creep) of metals. In this derivation, the conditions of mechanics i. e., the condition of equilibrium, and the continuity of displacement are fully satisfied. Hence the discrepancy between the calculated and experimental results is likely due to the error in representation of the component crystal characteristics. Recently Bassani (1990) and Wu et. al., (1990) have compressed a single crystal to activate a primary slip system, unloaded this crystal, then reoriented and compressed to activate a second slip system. He found the critical shear stress of the second system increases rapidly, i. e., high rate of hardening. This characteristic is not shown in a single crystal under a tensile loading. In the previous physical theories, the stress-strain relations of the component crystals were calculated from the polycrystal tensile test data (Lin, 1971) and this high hardening rate was

DESCRIPTORS: (U) *SHOCK WAVES, *IMPACT SHOCK, *PETROLEUM GEOLOGY, CLASSIFICATION, CONSERVATION, RECOVERY, SHOCK, SOLIDS, CRUDE OIL.

IDENTIFIERS: (U) PEB1102F, WUAFOSR2302C2.

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not encountered. In the present study, this high hardening rate is considered. It is found that the agreement between the calculated and experimental results is much further improved. Micromechanic, Plasticity, Polycrystals.

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

(U) Photostereoisomerization and the Magnetic Isotope Effect,

91 11P

DESCRIPTORS: (U) *CRYSTALS, *METALS, *STRESS STRAIN RELATIONS, DISPLACEMENT, ERRORS, GRAIN SIZE, HARDENING, HIGH RATE, MECHANICS, PLASTIC PROPERTIES, SINGLE CRYSTALS, TEST AND EVALUATION, TIME, STRAIN(MECHANICS), GRAIN STRUCTURES(METALLURGY), COMPRESSION, SHEAR STRESSES, TENSILE STRESS, PLASTIC PROPERTIES.

PERSONAL AUTHORS: Tarasov, V.; Ghatlia, N. D.; Buchachenko, A.; Turro, N. J.

CONTRACT NO. AFOSR-91-0340

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR, XF
TR-92-0496, AFOSR

UNCLASSIFIED REPORT

IDENTIFIERS: (U) PEG1102F, WUAFOSR2302B1, Uniaxial polycrystal tests, Slip systems, Micromechanics.

Availability: Pub. in Jnl. of Physical Chemistry, v95 p10220-10229 1991. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) The photodiastereomerization of meso and d,1-2,4-diphen 1pentan-3-one (meso-DPP and d,1 DPP, labeled and unlabeled with ¹³C at the carbonyl carbon) was invest in micellar solution to determine the probabilities of recombination of the micellized primary geminate radical pair toward formation of different combination products. A mathematical analysis is developed and employed to investigate the probabilities of formation of the combination products from the primary geminate radical pair produced by photochemical 44-cleavage. The extent of chemical conversion, the chemical yields of combination products, and the dependence of these two observables on the application of external magnetic fields are employed to arrive at conclusions concerning the probabilities of formation of combination products from the primary radical pair. An experimental parameter, S, which is determined by the extent of diastereoisomerization as a function of conversion, was shown to be constant and obtainable with high experimental accuracy. The values of S were found to depend on the initial stereochemistry of the starting DPP. The constancy of S and the observation of different values of S for different initial substrates place strong

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constraints on the relationships which are possible between the probabilities of combination of the geminate radical pair; radical pairs; photostereoisomerization; magnetic isotope effect.

DESCRIPTORS: (U) , ACCURACY, CHEMICALS, CLEAVAGE, CONSTANTS, CONVERSION, EXTERNAL, FUNCTIONS, ISOTOPE EFFECT, ISOTOPES, MAGNETIC FIELDS, MATHEMATICAL ANALYSIS, OBSERVATION, PARAMETERS, STEREOCHEMISTRY, SUBSTRATES, VALUE, REPRINTS, PROBABILITY, CARBONYL COMPOUNDS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303B2, Micellar solution, Primary radical pair, Diastereoisomerization, DPP(2 4-diphenylpentan-3-one), Geminate radical pair, Photostereoisomerization, SDS Micelles, Carbonyl carbon, Photochemistry, Products.

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES LOKER
HYDROCARBON RESEARCH INST

(U) Synthesis and Characterization of Poly((2-trimethylsilyl)-2-cyclopentene-1,4-diyl(vinylene)).

91 3P

PERSONAL AUTHORS: Stonich, Derek A.; Weber, William P.

CONTRACT NO. AFOSR-89-0007

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR, XF
TR-92-0476, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Polymer Bulletin, v26 p493-497 1991.
Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) Ring opening metathesis polymerization (ROMP) of 2-trimethylsilylbicyclo 2.2.1 (1) with a tungsten Hexachloride/tetramethyltin co-catalyst system yields poly(2-TRIMETHYLSILYL-2-CYCLOPENTENE-1,4-DIYL VINYLEN (II)). The product polymer (II) has been characterized by ¹H, ¹³C, ²⁹Si, IR and UV-VIS spectroscopy. Its molecular weight distribution has been determined by gel permeation chromatography (GPC), its thermal stability by thermogravimetric analysis (TGA) and its glass transition temperature (T_g) by differential scanning calorimetry (DSC). Ring opening metathesis Polymerization (ROMP) 2-trimethylsilylbicyclo (2.2.1)-hept-2,5-diene.

DESCRIPTORS: (U) *CYCLOPENTENES, *SYNTHESIS, CATALYSTS, DIENES, DISTRIBUTION, GELS, GLASS, MOLECULAR WEIGHT, OPENINGS, RINGS, SCANNING, SPECTROSCOPY, STABILITY, THERMAL STABILITY, TRANSITIONS, TUNGSTEN, WEIGHT REPRINTS, POLYMERS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303B2, *Poly((2-trimethylsilyl)-2-cyclopentene-1 4-diyl(vinylene)), *ROMP(Ring Opening Metathesis Polymerization), Hexachloride, Tetramethyltin, Vinyl silanes.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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ROCHESTER UNIV NY DEPT OF CHEMISTRY

AD-A251 490

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PITTSBURGH UNIV PA

7/4

20/2

(U) Biexciton States and Two-Photon Absorption in Molecular Monolayers.

JUL 91

11P

PERSONAL AUTHORS: Spano, Francis C.; Agranovich, Vladimir; Mukamel, Shaul

PERSONAL AUTHORS: Henderson, M. A.; Yates, J. T., Jr

CONTRACT NO. AFOSR-90-0054

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. A2

TASK NO. B3

MONITOR: AFOSR, XF
TR-92-0473, AFOSRMONITOR: AFOSR, XF
TR-92-0491, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Chemical Physics, v95 n2 p1400-1409, 15 Jul 91. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) Exciton-exciton interactions in doubly electronically excited molecular monolayers, may result in the formation of bound two-exciton states (biexcitons), whose binding is induced by the change in the molecular permanent dipole moments upon electronic excitation. We solve for the biexciton energies in the dipole approximation, and explore the effects of biexcitons on the monolayer nonlinear susceptibility. Calculations are made for monolayers with molecular dipole moments oriented either parallel or perpendicular to the monolayer surface. Biexcitons, Third order susceptibilities, Molecular monolayers, Intermolecular nonlinearities.

DESCRIPTORS: (U) *DETERMINANTS(MATHEMATICS), *DIPOLE MOMENTS, DIPOLES, ELECTRONICS, EXCITATION, EXCITONS, INTERACTIONS, MOMENTS, SURFACES, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR230383.

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TJ5005

Availability: Pub. in Surface Science, v268 p189-204 1992. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) The interaction of coadsorbed CO and H₂ on the steps of Pt(112)Pt(S)3(111)x(001) was examined by digital electron-stimulated desorption ion angular distribution (ESDIAD), low-energy electron diffraction (LEED) and temperature-programmed desorption (TPD). On the clean surface, CO and H₂ both adsorb preferentially on step sites at low coverages; CO at atop sites on the step edge and H₂, as atoms, in the step 4-fold sites. For pure CO adsorption, an ordered (2 x n) structure of step CO is observed at 0.19 ML (atop step sites half filled), and at least two CO structural transformations occur as the step sites fill further. These structural transformations, due to CO-CO repulsions, involve the production of tilted CO species whose tilt directions are related to the local CO coverage in one-dimensional chains of CO on the step edges. The structural transformations described above for pure CO layers on the step edges can also be produced by coadsorption of hydrogen on the (2 x n) step CO structure. The CO structural transformations in the coadsorbed system are driven by H adsorption, due to the formation of immiscible one-dimensional CO and H islands at the steps. Similar results are observed for low coverages of CO adsorbed on the H atom saturated surface. Chemisorption, defect site, platinum, carbon monoxide, hydrogen.

DESCRIPTORS: (U) *ADSORPTION, *CARBON MONOXIDE,

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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*HYDROGEN, *ISLANDS, *ONE DIMENSIONAL, *PLATINUM, ATOMS, CARBON, CHAINS, CHEMISORPTION, DESORPTION, EDGES, ELECTRONS, ENERGY, INTERACTIONS, IONS, LAYERS, LOW ENERGY, MONOXIDES, PRODUCTION, SITES, STRUCTURES, SURFACES, TEMPERATURE, TILT, TRANSFORMATIONS, REPRINTS, CRYSTAL STRUCTURE, MOLECULES.

UNIVERSITY OF NORTH TEXAS DENTON DEPT OF CHEMISTRY

(U) Structure of a Bromonitro-Substituted 2-Oxapentacyclo(7.3.0.0(3.7).0(4.12).0 (6.10))Dodecane,

90 4P

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A2, Step sites, Step edges, Defect sites.

PERSONAL AUTHORS: Watson, William H.; Kashyap, Ram P.; Marchand, Alan P.; Rajapaksa, D.

CONTRACT NO. AFOSR-88-0132

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR, XF
TR-92-0449, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Acta Crystallography, vC46 p2191-2194 1990. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) The X-ray crystal structure of 5-bromo-11-ethylenedioxy-5-nitro-2-oxa is described. X-ray crystal structure, Polycyclic cage compound, Geminal bromonitro cage compound.

DESCRIPTORS: (U) *CRYSTAL STRUCTURE, *X RAYS, *POLYCYCLIC COMPOUNDS, CRYSTALS, STRUCTURES, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A3, *Geminal bromonitro cage compounds, Envelope conformations, Boat conformations.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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AD-A251 454 CONTINUED

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

(U) Photophysical Investigation of Similarities between Starburst Dendrimers and Anionic Micelles.

the obvious structural differences between aggregates and dendrimer molecules, some striking similarities exist in the electron transfer; micelles; starbursts; dendrimers luminescence, macromolecules.

DESCRIPTIVE NOTE: Rept. for 1990-1991.

91 10P

DESCRIPTORS: (U) *ELECTRON TRANSFER, *MACROMOLECULES, *PHOTONS, DECAY, DYNAMICS, ELECTRONS, EXITS, KINETICS, LUMINESCENCE, MODELS, MOLECULES, MONITORING, PHASE, PROBES, QUENCHING, RATES, TRANSFER, REPRINTS.

PERSONAL AUTHORS: Gopidas, K. R.; Leheny, A. R.; Caminati, G.; Turro, N. J.; Tomalia, D. A.

IDENTIFIERS: (U) PE61102F, WUAFOSR230382, Dendrimers.

CONTRACT NO. AFOSR-91-0340

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR, XF
TR-92-0323, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of the American Chemical Society, v113 p7335-7342 1991. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT. (U) The dynamics of the electron transfer quenching of photoexcited Ru(phen) 3 2+ by methyl 3 viologen in solutions containing various anionic micelles and anionic starburst dendrimers were investigated by the single-photon-counting technique by monitoring the Luminescence decay of the excited complex. Analysis of the kinetics of luminescence quenching revealed that the quenching process in higher generation (G 3, 5 and higher) starburst dendrimer solutions obeys a general kinetic model previously employed for micellar solutions. In these cases the intramolecular or intrastarburst quenching rate constants (k_q) were found to be unimolecular and decreased with increasing the size of the host. In the case of lower generation starburst dendrimer (G=2, 5 and lower) as with smaller micelles (C 7 and C-8 alkylsodium sulfates), the quenching reaction was found to be bimolecular in nature. This bimolecular quenching is attributed to the rapid exit of the probe from these macromolecules into the aqueous phase during its lifetime. Quenching studies using an anionic quencher such as K4 Fe(CN) 6 substantiates this conclusion. Thus, in spite of

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ROCHESTER UNIV NY DEPT OF CHEMISTRY

(U) Manipulation of Molecular Motions Using Femtosecond Pulse Sequences.

91 3P

PERSONAL AUTHORS: Mukamel, Shaul; Yan, Yi J.

CONTRACT NO. AFOSR-90-0054

PROJECT NO. 2303

TASK NO. 83

MONITOR: AFOSR, XF
TR-92-0485, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Physical Chemistry, v95 n3 p1015-1016, 1991. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) Off-resonant coherent Raman experiments using a femtosecond pulse train have been recently used to selectively excite molecular vibrational modes. We discuss the relevance of this technique to laser controlled chemistry. Pulse shaping, four wave mixing, impulsive-Raman, solvation dynamics.

DESCRIPTORS: (U) *PULSED LASERS, *MOLECULAR VIBRATION, CHEMISTRY, DYNAMICS, LASERS, PULSE TRAINS, PULSES, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B3, Femtosecond pulses.

AD-A251 376 7/4 7/6

ROCHESTER UNIV NY DEPT OF CHEMISTRY

(U) Cooperative Nonlinear Optical Response of Molecular Aggregates: Crossover to Bulk Behavior.

MAR 91 SP

PERSONAL AUTHORS: Spano, Francis C.; Mukamel, Shaul

CONTRACT NO. AFOSR-90-0054

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR, XF
TR-92-0484, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Physical Review Letters, v68 n9 p1197-1200, 4 Mar 91. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) Equations of motion for the nonlinear optical response of arbitrary size molecular aggregates are derived. The relative role of intramolecular and intermolecular (two exciton) nonlinearities and the cooperative enhancement induced by the latter are analyzed. A crossover from $\text{sq. } N$ to $-N$ scaling of the nonlinear polarizability is predicted as the aggregate dimension becomes comparable to the optical wavelength, N being the aggregate size. The limitations of the local-field approximation are demonstrated. Cooperative nonlinear response, molecular polymers exciton coherence size, local fields, biexcitons.

DESCRIPTORS: (U) *EQUATIONS OF MOTION, *EXCITONS, *NONLINEAR ANALYSIS, COHERENCE, LIMITATIONS, POLYMERS, RESPONSE, POLARIZATION, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B3, Optical wavelength, *Molecular aggregates, *Nonlinear optical responses.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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AD-A251 367 4/2

ROCHESTER UNIV NY DEPT OF CHEMISTRY

COLORADO STATE UNIV FORT COLLINS DEPT OF ATMOSPHERIC SCIENCE

(U) Impulsive Pump-Probe and Photon-Echo Spectroscopies of Dye Molecules in Condensed Phases.

(U) Clouds - Their Prediction and Simulation.

DEC 90 5P

DESCRIPTIVE NOTE: Annual interim rept. 1 Jun 91-31 Mar 92.

PERSONAL AUTHORS: Bosma, Wayne B.; Yan, Yi J.; Mukamel, Shaul

MAY 92 10P

PERSONAL AUTHORS: Cotton, W. R.; Stephens, G. L.; Flatau, P. J.

CONTRACT NO. AFOSR-90-0054

PROJECT NO. 2303

PROJECT NO. 2310

TASK NO. B3

TASK NO. A1

MONITOR: AFOSR, XF
TR-92-0479, AFOSR

MONITOR: AFOSR, XF
TR-92-0467, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

Availability: Pub. in Physical Review A, v42 n1 p6920-6923, 1 Dec 90. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) Summary of research advances during FIRE II modelling and aircraft operations in provided. Discussion of mesoscale forecasts during FIRE 11 using RAMS model is given. Advances in radiative transfer module and scattering by irregular particles are reported. New cloud physics parameterization of homogeneous nucleation is described. Planned research in the area of cirrus, stratocumulus, and cumulus predictions are defined. Cloud prediction, cirrus, stratocumulus, mesoscale modeling, radiative transfer, cloud physics.

ABSTRACT: (U) A theory for impulsive resonant pump-probe and photon echo spectroscopies of polyatomic dyes in solution is developed. A multimode calculation in which the intramolecular and solvation modes are modeled as Brownian oscillators is presented. Electronic dephasing, the time-dependent Stokes shift, and quantum beats are analyzed. Four wave mixing, femtosecond spectroscopy, quantum beats, vibrational effects in pump-probe and photon-echo spectroscopy.

DESCRIPTORS: (U) *DYES, *ECHOES, *PHOTONS, *PROBES, *PUMPS, *SPECTROSCOPY, *ELECTRONICS, MIXING, MULTIMODE, OSCILLATORS, SOLVATION, THEORY, PHASE TRANSFORMATIONS, POLYATOMIC MOLECULES, REPRINTS.

DESCRIPTORS: (U) *CLOUD PHYSICS, *CLOUDS, *WEATHER FORECASTING, *ATMOSPHERE MODELS, AIRCRAFT, MODELS, NUCLEATION, OPERATION, PARTICLES, PHYSICS, PREDICTIONS, RADIATIVE TRANSFER, SCATTERING, TRANSFER.

IDENTIFIERS: (U) WUAFOSR2310A1, PE61102F.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B3, *Condensed phase, Intramolecular modes, Stokes shift, Quantum beats, Nuclear vibration, Photon echo, Dye molecules, Four wave mixing, Femtoseconds.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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AD-A251 317 20/6

TUSKEGEE UNIV AL MATERIALS RESEARCH LAB

ROCHESTER UNIV NY DEPT OF CHEMISTRY

(U) Development of Capability for Characterization of Ceramic/Ceramic Composites. Part 1. Effects of Reinforcement Geometry on the Mechanical Properties of SiCw/Al2O3 Composites and Prediction of Flexural Properties by Energy Method.

(U) Cooperative Radiative Dynamics in Molecular Aggregates.

JUN 91 13P

PERSONAL AUTHORS: Spano, Francis C.; Kuklinski, Jan R.; Mukamel, Shaul

DESCRIPTIVE NOTE: Technical rept..

CONTRACT NO. AFOSR-90-0054

JAN 91 49P

PROJECT NO. 2303

PERSONAL AUTHORS: Jeelani, Shaik; Mahfuz, Hassan; Haque, Anwarul; Salekeen, Sirajus

TASK NO. B3

CONTRACT NO. F49620-89-C-0016

MONITOR: AFOSR, XF

TR-92-0480, AFOSR

PROJECT NO. 2302

UNCLASSIFIED REPORT

TASK NO. B5

MONITOR: AFOSR, XF
TR-92-0454, AFOSR

Availability: Pub. in Jnl. of Chemical Physics, v94 n11 p7534-7544, 1 Jun 91 Available only to DTIC users. No copies furnished by NTIS.

UNCLASSIFIED REPORT

ABSTRACT: (U) This report describes the progress made during the second year of a two-year program funded by the United States Air Force, Office of Scientific Research, to develop experimental and analytical capability to characterize Ceramic/Ceramic composites at room and elevated temperatures. Composites, Ceramics, Silicon Carbide, Aluminum Oxide, Flexure, Fracture.

DESCRIPTORS: (U) *CERAMIC MATERIALS, AIR, AIR FORCE, ALUMINUM, ALUMINUM OXIDES, CARBIDES, OXIDES, SILICON, SILICON CARBIDES, TEMPERATURE, UNITED STATES, UNITED STATES AIR FORCE ACADEMY, COMPOSITE MATERIALS, MECHANICAL PROPERTIES, PREDICTIONS, FLEXURAL PROPERTIES, WHISKER COMPOSITES, FRACTURE(MECHANICS), TOUGHNESS, ENERGY.

IDENTIFIERS: (U) PE61102F, WUAFOSR230285, Development, Capability, Characterization, Reinforcement geometry.

ABSTRACT: (U) We theoretically investigate the radiative dynamics of molecular aggregates with physical dimensions much smaller than an optical wavelength. The fluorescence decay rate of a one dimensional aggregate consisting of N electronically coupled two-level molecules interacting with acoustic and optical lattice phonons is calculated. The linear dependence (superradiance) of the radiative decay rate on the aggregate size N is shown to be quenched by exciton-photon coupling. An increase of aggregate size N eventually leads to a convergent, size independent decay rate, which is N times faster than the monomer decay rate. The coherence size, N*, is generally a function of the exciton-phonon coupling strength, the phonon bandwidth and the aggregate temperature. For low frequency phonons, a scaling law is obtained and an empirical relation for the temperature dependence N* T^{1/3} is derived. Superradiance, temperature-dependent exciton coherence length, cooperative radiative response.

DESCRIPTORS: (U) *COHERENCE, *OPTICAL PROPERTIES, ACOUSTICS, BANDWIDTH, COUPLINGS, DECAY, DYNAMICS, EXCITONS, FLUORESCENCE, FREQUENCY, LENGTH, LOW FREQUENCY, MONOMERS, PHONONS, PHOTONS, RATES, TEMPERATURE, NONLINEAR OPTICS, REPRINTS.

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NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF MATHEMATICS

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B3, *Molecular aggregates, *Radiative dynamics, Superradiance, Exciton coherence length.

(U) Nonlinear Dynamics.

DESCRIPTIVE NOTE: Final rept. 1 Dec 88-31 Jul 91,

JUL 91 2P

PERSONAL AUTHORS: Newhouse, Sheldon E.

CONTRACT NO. F49620-89-C-0025

PROJECT NO. 6624

TASK NO. 00

MONITOR: AFOSR, XF
TR-92-0284, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) During the tenure of this grant significant progress on several problems was made. A simple treatment with much improved proofs of Hofbauer's theory of symbolic dynamics for mappings of an interval were obtained. Moreover, the researchers generalized and extended his results to more complicated interval mappings and to certain maps in two dimensional systems. Furthermore, they made progress on developing a general theory of symbolic dynamics for systems with two degrees of freedom. Finally, they completed work on certain algorithms for the computation of topological entropy in smooth systems.

DESCRIPTORS: (U) *NONLINEAR SYSTEMS, *MATHEMATICS, *SYMBOLIC PROGRAMMING, ALGORITHMS, COMPUTATIONS, DEGREES OF FREEDOM, DYNAMICS, INTERVALS, THEORY, TWO DIMENSIONAL, MAPPING(TRANSFORMATIONS).

IDENTIFIERS: (U) PE62301E, WUAFOSR662400, *Hofbauer's Theory, Symbolic dynamics, Topological entropy, Smooth system.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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VIRGINIA POLYTECHNIC INST AND STATE UNIV BLACKSBURG DEPT
OF MATHEMATICS

JOHNS HOPKINS UNIV BALTIMORE MD

(U) An Integrated Research Program for the Modeling,
Analysis and Control of Aerospace Systems.

(U) Spin-Forbidden Decay of the Dication HS2(+),

DESCRIPTIVE NOTE: Final rept. 31 Aug 87-30 Sep 91,

JUN 91 SP

MAR 92 30P

PERSONAL AUTHORS: Parlant, Gerard; Senekowitsch, Jorg;
O'Neill, Stephen V.; Yarkony, David R.

CONTRACT NO. AFOSR-90-0051

PERSONAL AUTHORS: Burns, J. A.; Cliff, E. M.; Herdman, T.
L.

PROJECT NO. 2302

CONTRACT NO. F49620-87-C-0116

TASK NO. 83

PROJECT NO. 6121

MONITOR: AFOSR, XF
TR-92-0488, AFOSR

TASK NO. 00

UNCLASSIFIED REPORT

MONITOR: AFOSR, XF
TR-92-0285, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The following is a summary list of accomplishments under this contract: (1) ICAM was established in August of 1987. (2) An interactive computer system was developed. (3) Over 85 research papers were produced. (4) Over 33 students were supported in part by the contract. (5) More than 12 PhD's and 5 MS students were produced. (6) Seven Post Doctoral Associates were supported. (7) More than 65 short term visitors came to Virginia Tech (16 of these were long term visitors). (8) Over 100 scientists attended the conference on Numerical Methods for Partial Differential Equations.

DESCRIPTORS: (U) *AEROSPACE SYSTEMS, COMPUTERS,
SCIENTISTS, STUDENTS, VIRGINIA, COMPUTER PROGRAMS, THESES.

IDENTIFIERS: (U) PE62301E, WUAFOSR612100.

Availability: Pub. in Jnl. Chemical Physics, v94 n11
p7208-7210, 1 Jun 91. Available only to DTIC users. No
copies furnished by NTIS.

ABSTRACT: (U) The lifetimes of the low-lying vibrational levels of the X2 II state of the recently identified dication HS2(+) are considered. The stability of this state is attributable to a barrier formed from the avoided crossing of (2) II states asymptotically characterized as H(+) + S(+) and H + S2(+). As a result of this barrier, the nonrelativistic X2 II potential energy curve supports several quasisubound vibrational levels that are long lived with respect to tunneling. However, this is not the principal decay mechanism.

DESCRIPTORS: (U) *HYDROGEN SULFIDE, *DECAY, *SPIN STATES,
CATIONS, BARRIERS, REPRINTS, POTENTIAL ENERGY, TUNNELING,
GROUND STATE, SULFUR, ELECTRONIC STATES, PERTURBATION
THEORY.IDENTIFIERS: (U) WUAFOSR2303B3, PE61102F, *Dications,
*Forbidden, Vibrational levels, Nonrelativistic,
Lifetimes, Spin orbit induced perturbation, Asymptotes.

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DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T85005

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FLORIDA UNIV GAINESVILLE

(U) Analytic MBPT Energy Derivatives: A Powerful Tool for the Interpretation and Prediction of Vibrational Spectra for Unusual Molecules.

91

30P

PERSONAL AUTHORS: Bartlett, R. J.; Stanton, J. F.; Watts, J. D.

CONTRACT NO. AFOSR-89-0207

PROJECT NO. 2303

TASK NO. F5

MONITOR: AFOSR, XF
TR-92-0430, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Advances in Molecular Vibrations and Collision Dynamics, v18 p139-167 1991. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) A number of chemical applications of analytic energy gradient evaluation at the level of second-order many-body perturbation theory MBPT(2) are reviewed, with an emphasis on studies carried out by our group on carbon clusters and electron-deficient boron hydrides and related compounds. The effects of electron correlation on theoretically calculated harmonic force constants and infrared intensities are also discussed, as well as the importance of basis set selection. MBPT, CC, vibrational states, boron hydrides, gradient.

DESCRIPTORS: (U) *BORON HYDRIDES, *VIBRATIONAL SPECTRA, BORON, CARBON, ELECTRONS, ENERGY, GRADIENTS, HARMONICS, HYDRIDES, PERTURBATION THEORY, THEORY, REPRINTS.

IDENTIFIERS: (U) WUAFOSR2303F5, PE61102F, MBPT(Many Body Perturbation Theory).

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ROCHESTER UNIV NY DEPT OF CHEMISTRY

(U) Polaron and Size Effects in Optical Line Shapes of Molecular Aggregates.

AUG 91

21P

PERSONAL AUTHORS: Lu, Ning; Mukamel, Shaul

CONTRACT NO. AFOSR-90-0054

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR, XF
TR-92-0482, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Chemical Physics, v95 n3 p1588-1607, 1 Aug 91. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) Optical absorption and fluorescence line shapes of molecular aggregates are calculated using a variational method and the dynamical coherent potential approximation (DCPA) which account for strong exciton-phonon coupling. The formation and the quantum sin effects of excitonic polarons are studied. Polaritons, molecular aggregates, self-trapped excitons.

DESCRIPTORS: (U) *EXCITONS, ABSORPTION, COUPLINGS, FLUORESCENCE, PHONONS, VARIATIONAL METHODS, OPTICAL PROPERTIES, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B3, *Molecular aggregates, Polarons, DCPA(Dynamical Coherent Potential Approximation).

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OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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ROCHESTER UNIV NY DEPT OF CHEMISTRY

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

(U) Melting and the Electronic Absorption of Benzene-Argon Clusters.

(U) Microenvironmental Control of Photochemical Reactions.
3. Additive Effects on Micellar Structure and Properties of TX-100.

MAY 91 5P

91 6P

PERSONAL AUTHORS: Fried, Laurence E.; Mukamel, Shaul

PERSONAL AUTHORS: Lei, Xue-Gong; Tang, Xiao-Dou; Liu, You-Cheng

CONTRACT NO. AFOSR-90-0054

PROJECT NO. 2303

CONTRACT NO. AFOSR-91-0340

TASK NO. B3

PROJECT NO. 2303

MONITOR: AFOSR, XF
TR-92-0483, AFOSRMONITOR: AFOSR, XF
TR-92-0497, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

Availability: Pub. in Physical Review Letters, v66 n18 p2340-2343, 6 May 91. Available only to DTIC users. No copies furnished by NTIS.

Availability: Pub. in Langmuir, v7 n12 p2872-2876 1991. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) The coexistence of sharp and broad features in the electronic spectrum of a chromophore embedded in a rare-gas cluster has been interpreted as a signature of solid-liquid phase coexistence in the melting transition. We perform molecular-dynamics simulations of benzene-ArN clusters which show that the observed spectral features are instead dominated by inhomogeneous broadening due to various cluster configurations. Spectral Lineshapes of Clusters molecular dynamics, melting of clusters.

DESCRIPTORS: (U) *LIQUID PHASES, *MELTING, BENZENE, CHROMOPHORES, CONFIGURATIONS, DYNAMICS, LIQUIDS, PHASE, SIGNATURES, SIMULATION, SOLIDS, TRANSITIONS, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B3, *Molecular dynamics, *Benzene argon clusters, Electronic spectra.

ABSTRACT: (U) The cage effects of radical pairs produced by photolysis of p-methyl dibenzyl ketone, 1, as well as the fluorescence spectra of pyrene, 2, and 1,3-dinaphthylpropane, 3 in aqueous solutions containing TX 100 (TX) have been determined as a function of the concentration of TX and of the concentration of added ionic surfactants SODIUM DODECYL BENZENESULFATE (SDS) and cetyl trimethylammonium bromide (CTAB) and neutral electrolytes. The results indicate that both the aggregation and micellar properties of TX are significantly influenced by the molecules of 1 solubilized in TX micelles. The results also show that comicelles are formed between TX and ionic surfactants and that the interior polarity of TX micelle is lowered by the addition of ionic surfactants. Neutral electrolytes are found to have at least two effects upon the aggregation of TX and its micellar properties: increasing-ionic strength increases the dissimilarity between the TX micelle and the water phase and thus decreases the critical micelle concentration (cmc) and simultaneously enhances the interior micellar microviscosity. In addition, at a high concentration of electrolytes, the micellar volume changes. It is

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suggested that only the ions bonded onto the surface of the micelles significantly influence micellar parameters such as microviscosity and cage effects. photochemical reactions; TX-100; micellar viscosity.

DESCRIPTORS: (U) *PHOTOCHEMICAL REACTIONS, *ADDITIVES, ADDITION, BENZENE, ELECTROLYTES, FLUORESCENCE, FUNCTIONS, IONS, KETONES, MOLECULES, NEUTRAL, PARAMETERS, PHASE, PHOTOLYSIS, POLARITY, SPECTRA, SURFACE ACTIVE SUBSTANCES, SURFACES, VISCOSITY, VOLUME, WATER, REPRINTS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303B2, *Microenvironmental control, Micellar structures, TX 100, Radical pairs, Dibenzyl ketones, SDBS(Sodium Dodecyl Benzene Sulfate), Pyrenes, Naphthylpropane, CTAB(Cetyl Trimethylammonium Bromide).

WASHINGTON UNIV SEATTLE

(U) Synthesis and Reactivity of Trans-Re(CO)₃(PPh₃)₂ and Trans-(Me₃SiO)₃V NRe(CO)₃(PPh₃)₂.

91 6P

PERSONAL AUTHORS: Hoffman, Norris W.; Prokopuk, Nicholas; Robbins, Martha J.; Jones, Carolyn M.; Doherty, Nancy M.

CONTRACT NO. AFOSR-87-0362

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR, XF
TR-92-0469, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Inorganic Chemistry, v30 p4177-4188 1991. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) The d6 fluoro complex trans-Re(CO)₃(PPh₃)₂ (1) has been prepared in good yield by reaction of trans-ReI(CO)₃(PPh₃)₂ (2) with Ag(SO₃CF₃) followed by N(PPh₃)₂F. Addition of 2 equiv of N(PPh₃)₂Cl to 1 affords not the expected simple anion-metathesis equilibrium, but a mixture containing 2 as well as other species. The lability of 1 toward carbonyl exchange with 13CO and toward reaction with NCS- has been examined and is far greater than that for 2. Compound 1 reacts with V(NSiMe₃)(OSiMe₃)₃ (4) to form Me₃SiF and trans-(Me₃SiO)₃V=NRe(CO)₃(PPh₃)₂ (5), whereas no reaction is observed upon addition of the chloro complex 2 to 4. Reaction of 5 with Me₃SiCl cleanly substitutes chlorides for the trimethylsiloxy groups on vanadium to generate transCl₃V=NRe(CO)₃(PPh₃)₂ (6), with no evidence for the expected cleavage of the nitride bridge to yield 2 and 4. Spectroscopic and solution properties of this series of compounds and comparisons of the fluoro complex (1) with its heavier halo analogues are presented. transition metal, fluoride, nitride, complex.

DESCRIPTORS: (U) *TRANSITION METALS, *VANADIUM, *SYNTHESIS(CHEMISTRY), *RHENIUM, *REACTIVITIES, ADDITION.

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ANIONS, BRIDGES, CHLORIDES, CLEAVAGE, COMPARISON, EXCHANGE, FLUORIDES, METALS, MIXTURES, NITRIDES, SUBSTITUTES, TRANSITIONS, YIELD, REPRINTS, CARBONYL COMPOUNDS, SILICON, NITROGEN, SPECTROSCOPY, ORGANOMETALLIC COMPOUNDS.

WASHINGTON UNIV SEATTLE

(U) Reactions at Metal-Bound Nitrogen Atoms. Synthesis and Structure of $V(NPMePh_2)Cl_4(NCMe)$ MeCN,

91 4P

IDENTIFIERS: (U) *Fluoro complex, Metathesis equilibrium, Stability, Chloro complex, Trimethylsiloxy groups, Bis(Triphenylphosphine).

PERSONAL AUTHORS: Schomber, Beth M.; Ziller, Joseph W.; Doherty, Nancy M.

CONTRACT NO. AFOSR-87-0362

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR, XF
TR-92-0470, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Inorganic Chemistry, v30 p4488-4490 1991. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) $V(NSiMe_3)Cl_3$ reacts with PCl_2MePh_2 in dichloromethane to form a vanadium(V) phosphiniminato complex, $V(NPMePh_2)Cl_4$, with release of $ClSiMe_3$. Addition of coordinating solvents ($L = MeCN, THF, or py$) produces $V(NPMePh_2)Cl_4(L)$. The crystal structure of the acetoneitrile adduct, isolated as the monosolvate $V(NPMePh_2)Cl_4(NCMe) \cdot MeCN$, is reported. The distorted octahedral geometry and the ligand bond distances and angles suggest description of the molecule as possessing a -N triple bond and an N-P single bond. $(MeCN)Cl_4VsN-PMePh_2$. Reaction of Cl_2 with $V(NSiMe_3)Cl_3$ cleanly produces a known chloroimido compound, $V(NCl)Cl_3I_2$. This chemistry and other previously reported reactions of $V(NSiMe_3)Cl_3$ illustrate the variety of reactivity available at the metal-bound nitrogen atom of silylimido ligands. transition-metal, nitride, silylimido, phosphiniminato complex, reactivity, chloroimino.

DESCRIPTORS: (U) *ATOMS, *NITROGEN, ACETONITRILE, ADDITION, ANGLES, CHEMISTRY, CRYSTAL STRUCTURE, CRYSTALS, GEOMETRY, LIGANDS, METALS, MOLECULES, NITRIDES, REACTIVITIES, RELEASE, STRUCTURES, TRANSITION METALS, TRANSITIONS, REPRINTS, CHEMICAL REACTIONS.

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SYNTHESIS(CHEMISTRY), SOLVENTS.

IDENTIFIERS: (U) *Metal bound, Silylimido, Chloroimino,
*Vanadium phosphiniminato complex, VN Triple band, NP
Single band.

AD-A251 219 7/2

VANDEBILT UNIV NASHVILLE TN

(U) Ab Initio F-Center Electron Topology in LiF.

JAN 92 10P

PERSONAL AUTHORS: Ewig, Carl S.; Tellinghuisen, Joel;
Mendenhall, Marcus H.

CONTRACT NO. AFOSR-90-0030

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR, XF
TR-92-0464, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Chemical Physics Letters, v188 n5-6
p501-509, 17 Jan 92. Available only to DTIC users. No
copies furnished by NTIS.

ABSTRACT: (U) Nonempirical quantum theoretical
computations based on a cluster model are employed to
study the detailed electronic distributions of the ground
and first excited electronic states of the F center in
crystalline LiF. We determine the degree of localization,
as well as the radial and angular electron distributions,
for the ground and first excited electronic state. In
agreement with prior studies, the unpaired electron in
the ground state is found to be primarily localized in
the center of the defect. It is nearly spherical with an
approximately gaussian radial distribution. The first
F11 state however shows the unpaired electron to be
almost completely delocalized into the crystal lattice. We
report the T1u A1g vertical transition energy and the
unpaired electron densities at the nuclei in the first
three shells of surrounding ions. These results are in
satisfactory agreement with experimental UV absorption
data and ENDOR measurements. F-centers, ab initio quantum
chemistry, LiF, electron topology, alkali halides,
electronic defects, transition energies, cluster model.

DESCRIPTORS: (U) *HALIDES, *NUCLEI, *LITHIUM FLUORIDES,
ABSORPTION, AGREEMENTS, CHEMISTRY, COLOR CENTERS,
COMPUTATIONS, CRYSTAL LATTICES, CRYSTALS, DISTRIBUTION.

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ELECTRONIC STATES, ELECTRONICS, ELECTRONS, ENERGY, GROUND
STATE, IONS, MEASUREMENT, MODELS, QUANTUM CHEMISTRY,
TOPOLOGY, TRANSITIONS, REPRINTS.

VANDERBILT UNIV NASHVILLE TN DEPT OF CHEMISTRY

(U) Spectroscopy of Metastable Species in a Free-Jet
Expansion: The D' to A'(Reverse) Transition of I2.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303A2.

APR 92 9P

PERSONAL AUTHORS: Zheng, Xiaonan; Fei, Suli; Heven,
Michael C.; Tellinghuisen, Joel

CONTRACT NO. AFOSR-90-0030

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR, XF
TR-92-0466, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Chemical Physics, v96 n7
p4877-4883, 1 Apr 92. Available only to DTIC users only.
No copies furnished by NTIS.

ABSTRACT: (U) The A'2u 3 state of I2 is observed in a
free-jet expansion of I2 in Ar, where it is prepared by
ArF laser irradiation. Laser excitation spectra are
recorded for 37 bands in the v' 0' progression of the D'
2g(3P2) A' transition. The spectra display rotational
temperatures of ~5 K. At the 0.08-cm⁻¹ resolution of the
probe laser, rotational congestion near the band origins
necessitates analysis by a nonlinear least-squares
contour simulation method. Subsequent correlated fits of
the band-by-band results are combined with other results
to produce global constants valid for v' = 0-86, v = 0-32.
UV spectroscopy, metastable states, free-jet expansion,
I2, nonlinear least squares, correlated least squares, D'
A' transition band contour analysis, laser excitation
spectra.

DESCRIPTORS: (U) *SPECTROSCOPY, *IODINE, *HALOGENS,
CONGESTION, CONSTANTS, CONTOURS, EXCITATION, EXPANSION,
GLOBAL, IRRADIATION, LASERS, PROBES, RESOLUTION,
SIMULATION, SPECTRA, TEMPERATURE, TRANSITIONS, METASTABLE
STATE, LASERS, ARGON LASERS, REPRINTS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303A2.

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VANDERBILT UNIV NASHVILLE TN

JOINT INST FOR LAB ASTROPHYSICS BOULDER CO

(U) Observation and Analysis of the Beta to A Reverse Transition of I2 in a Free-Jet Expansion.

(U) Effect of Enhanced Collision Energy on Product Vibrational Excitation for the Proton Transfer Reaction $O + HF$ Yields $F + OH(v=0,1)$.

91 14P

JAN 92 10P

PERSONAL AUTHORS: Zheng, Xiaonan; Fei, Suli; Heaven, Michael C.; Tellinghuisen, Joel

PERSONAL AUTHORS: Knutsen, K.; Bierbaum, V. M.; Leone, S. R.

CONTRACT NO. AFOSR-90-0030

CONTRACT NO. AFOSR-89-0073

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. A2

TASK NO. B1

MONITOR: AFOSR, XF
TR-92-0465, AFOSR

MONITOR: AFOSR, XF
TR-92-0459, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Molecular Spectroscopy, v149 p399-411 1991. Available only to DTIC users. No copies furnished by NTIS.

Availability: Pub. in Jnl. of Chemical Physics, v96 p298-306, 1 Jan 92. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) The A 1 σ 3II state of I2 is detected in a free-jet expansion of I2 in Ar, where it is prepared by ArF laser irradiation. Laser excitation spectra are recorded for -30 bands in the $v' + 0$ progression of the B $1g(3P2) - A$ transition, spanning $v' = 25-68$. For the heavy I2 molecule, the cold (5 K) rotational distributions in the initial level have peak population at $J = 7$. This translates into spectra which, at the resolution of the probe laser (0.08 cm^{-1}), are very congested near the band origins. These spectra are analyzed by a nonlinear least-squares contour simulation method. Subsequent correlated fits of the band-by-band results produce global constants which corroborate and extend the existing results for the rotational and vibrational constants of the B state. UV spectroscopy, metastable states, free-jet expansion, I2, nonlinear least squares, correlated least squares, B - A transition laser excitation spectra.

DESCRIPTORS: (U) *IRRADIATION, *HALOGENS, *VALENCE, CONSTANTS, CONTOURS, EXCITATION, EXPANSION, GLOBAL, LASERS, MOLECULES, POPULATION, PROBES, RESOLUTION, SIMULATION, SPECTRA, SPECTROSCOPY, TRANSITIONS, ARGON LASERS, REPRINTS.

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DESCRIPTORS: (U) *COLLISIONS, *ENERGY, *HYDROGEN FLUORIDE, *HYDROXYL RADICALS, DETECTION, DRIFT, DYNAMICS, FLUORESCENCE, FLUORIDES, HYDROGEN, IONS, LASERS,

oxygen; vibration.

ion-molecule potential energy surface which dominates the reaction dynamics. Hydrogen fluoride; ion-molecule; laser;

enhanced average collision energies of 9.6 and 15.4 kJ mol⁻¹, the OH($v = 1$) population increases to 0.25 \pm 0.02 and 0.3 \pm 0.03, respectively. The results are considered in terms of the deep attractive well in the

normalized the results at thermal energy to the absolute measurement by Hamilton et al. Chem. Phys. Lett. 94, 4 (1983). At thermal energy, the OH($v = 1$) fractional

population is OH($v = 1$)/OH($v = 0$ + OH($v = 1$)) is 0.18 \pm 0.01. At

determined for the OH product in the reaction $O + HF - F + OH(v=0,1)$ as a function of reactant center-of-mass

collision energy in a flow-drift tube. The OH($v=0,1$) vibrational states are measured using laser-induced fluorescence detection, and the relative vibrational

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MEASUREMENT, MOLECULES, OXYGEN, POPULATION, POTENTIAL ENERGY, SIGNALS, SURFACES, TUBES, VIBRATION, REPRINTS, CHEMICAL REACTIONS KINEMATICS.

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

(U) Solid State NMR and EPR Studies of Intracrystalline VS. External Surface Adsorption of Photoreactive Ketones in Pentasil Zeolites,

IDENTIFIERS: (U) PE81102F, WUAFOSR230381, *Proton transfer reactions, *Product vibrational excitation, Ion-molecule, Thermal energy, Light atom transfer reactions.

92 7P

PERSONAL AUTHORS: Garcia-Garibay, Miguel A.; Ottaviani, M. F.; Turro, Nicholas J.

CONTRACT NO. AFOSR-91-0340

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR, XF
TR-92-0438, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Molecular Crystals and Liquid Crystals, v211 p199-210, 1991. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) It has been shown that the recombination probabilities of radicals generated from photolysis of ketone precursors in pentasil zeolites can be controlled by the distribution of ketones on the internal and external zeolite surfaces as well as by the adsorption siting and sieving attributes of the radical fragments. Here we report the use of magnetic resonance techniques in the elucidation of the adsorbing sites of ketone reactants. The techniques employed include solid state ²⁹Si and ¹³C MASNMR to characterize the zeolite-framework and the ketone adsorbates respectively. EPR spectroscopy of the stable free radical Tempo was also used as a complementary technique to obtain information about the environment of the radical including its interactions with the surface and with the ketones. The latter interactions, when present, result in the broadening and shifting of the ¹³C NMR signals of the ketone. zeolites, photochemistry, solid-state NMR, dibenzyl ketone. EPR 2.2, 4.4-tetramethyl piperidine N-oxyl (TEMPO)

DESCRIPTORS: (U) *PHOTOCHEMICAL REACTIONS, *PIPERIDINES, *SPECTROSCOPY, ADSORBATES, ADSORPTION, DISTRIBUTION.

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ENVIRONMENTS, EXTERNAL, FRAGMENTS, FREE RADICALS,
INTERACTIONS, INTERNAL, KETONES, MAGNETIC RESONANCE,
PHOTOLYSIS, PRECURSORS, RESONANCE, SHIFTING, SIGNALS,
SITES, SOLIDS, SURFACES.

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

(U) Kinetics and Mechanism of the Photochromic
Transformations of N-salicylidene-4-hydroxy-3,5-
dimethylaniline and Its Complex with Uranium(VI)
Dioxide.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2.

92 3P

PERSONAL AUTHORS: Khudyakov, I. V.; Turro, N. J.;
Yakushenko, I. K.

CONTRACT NO. AFOSR-91-0340

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR, XF
TR-92-0437, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. Photochem. Photobiol. A. Chem.
v63 p25-31, 1992. Available to DTIC users only. No copies
furnished by NTIS.

ABSTRACT: (U) The title compounds were prepared and some
of their photophysical and photochemical properties
studied. The anil(LH) and its complex with uranium (C)
were found to possess very similar spectral and kinetic
characteristics, namely absorption and luminescence
spectra photoisomer spectra and isomerization kinetics.
From these measurements it is concluded that the
photoexcitation of the compounds in polar solvents
(methanol and acetonitrile) leads to proton transfer in
the excited singlet state with the formation of a trans
zwitterionic structure. The trans zwitterion emits light
and undergoes isomerization to form the cis zwitterion.
The latter compound is a photochromic intermediate which
participates in cis-trans isomerization (rate constant
 $k_{iso} = (3-4) \times 10^4 s^{-1}$) with the formation of the initial
anil or the uranyl complex. An energy-level scheme of the
reactions is presented. photochromism isomerization;
salicylaldehydes

DESCRIPTORS: (U) *ISOMERIZATION, *KINETICS,
*PHOTOCHROMISM, ABSORPTION, CONSTANTS, ENERGY, ENERGY

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LEVELS, LIGHT, LUMINESCENCE, MEASUREMENT, PROTONS, SPECTRA, STRUCTURES, TRANSFER, REPRINTS, PHOTOCHEMICAL REACTIONS, URANIUM, METHANOLS, ACETONITRILE.

ROCHESTER UNIV NY DEPT OF CHEMISTRY

(U) Real Versus Virtual Excitonic Stark Effect in Semiconductor Quantum Wells.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2, *Uranium dioxide, *N-Salicylidene-4-hydroxy-3,5-dimethylaniline. Photophysical properties. Polar solvents, Zwitterions, Anils, Salicylaldehydes, Complexes.

DEC 90 5P

PERSONAL AUTHORS: Kuklinski, J. R.; Mukamel, Shaul

CONTRACT NO. AFOSR-90-0054

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR, XF
TR-92-0494, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Physical Review B, v42 n18 p11,938-11,941, 15 Dec 90. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) We investigate the dynamics of the ac Stark effect induced by short laser pulses (pump-probe configuration) in Quantum-Well structures in the limits of both real excitonic population (resonant pump pulses) and citation (off-resonant pump pulses). We use a microscopic model describing exciton-phonon interaction in the weak-coupling limit, and the of small excitonic density (i.e. weak optical nonlinearity). Apart from adding a damping to the excitons, exciton phonon coupling renormalizes one of the two nonlinearity parameters. Semiconductor quantum wells, local fields, AC Stark effect, four wave mixing.

DESCRIPTORS: (U) *STARK EFFECT, *QUANTUM ELECTRONICS, *OPTICAL PUMPING, COUPLINGS, DAMPING, DENSITY, DYNAMICS, EXCITONS, INTERACTIONS, LASERS, MIXING, MODELS, PARAMETERS, PHONONS, POPULATION, PROBES, SEMICONDUCTORS, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B3, Quantum wells, Four wave mixing.

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ROCHESTER UNIV NY DEPT OF CHEMISTRY

WISCONSIN UNIV-MADISON DEPT OF STATISTICS

(U) Femtosecond Optical Spectroscopies of Solvated Polyatomic Molecules,

(U) Multivariate Model Building and Model Identification.

DESCRIPTIVE NOTE: Final rept. 1 Jan 90-31 Dec 91,

MAY 90 4P

DEC 91 4P

PERSONAL AUTHORS: Mukamel, Shaul; Yan, Yi-Jing

PERSONAL AUTHORS: Wamba, Grace

CONTRACT NO. AFOSR-90-0054

CONTRACT NO. AFOSR-90-0103

PROJECT NO. 2303

PROJECT NO. 2304

TASK NO. B3

TASK NO. A5

MONITOR: AFOSR, XF
TR-92-0492, AFOSRMONITOR: AFOSR, XF
TR-92-0538, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

Availability: Pub. in Proceedings of the Ultrafast Phenomena Conference, 14-17 May 90. Available to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) A multimode Brownian oscillator model is developed for third order nonlinear optical spectroscopies in condensed phases, taking into account molecular dynamics of coherent nuclear motions of the absorber and the dephasing and reorganization processes of solvent molecules. Calculations of femtosecond photon echo are discussed. Four wave mixing, femtosecond spectroscopy, quantum beats, vibrational effects in pump-probe and photon-echo.

DESCRIPTORS: (U) *SPECTROSCOPY, *POLYATOMIC MOLECULES, *SOLVATION, DYNAMICS, ECHOES, MIXING, MODELS, MOLECULES, MULTIMODE, OSCILLATORS, PHOTONS, PROBES, PUMPS, SOLVENTS, NONLINEAR OPTICS, ELECTRONICS, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B3, *Brownian oscillators, Femtosecond spectroscopy, Condensed phases, Coherent nuclear motions, Four wave mixing, Quantum beats, Vibrational effects.

ABSTRACT: (U) A substantial number of results were obtained during this grant in the area of multivariate function estimation, model building and model identification. There were also invited talks at universities during which some of the results were discussed.

DESCRIPTORS: (U) *MULTIVARIATE ANALYSIS, *MATHEMATICAL MODELS, BUILDINGS, FUNCTIONS, GRANTS, IDENTIFICATION, MODELS, NUMBERS, UNIVERSITIES, ESTIMATES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

(U) Molecular Recognition and Chemistry in Restricted Reaction Spaces. Photophysics and Photoinduced Electron Transfer on the Surfaces of Mice-les, Dendrimers and DNA.

91

10P

PERSONAL AUTHORS: Turro, Nicholas J.; Barton, Jacqueline K.; Tomalia, Donald A.

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR, XF
TR-92-0431, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Accounts of Chemical Research, v24 n11 p332-340 1991. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) This Account is concerned with molecular recognition in bimolecular reactions that occur in restricted spaces. Bimolecular reactions of interest are photoinduced electron transfers for which the reactants are positively electronically excited metal complexes and another positively charged gegemon, either a metal complex or methyl viologen that serves as an electron acceptor. The restricted reaction spaces are the interfacial regions of anionically charged polyions such as micelles, starburst dendrimers, and DNA Molecular recognition is concerned with how specific sites on a molecular receptor are recognized by a binding substrate. Knowledge of the underlying principles of molecular recognition is useful in diverse activities such as the design of site- and conformation specific reagents for biomolecules, the rational design of drugs and probes of polymer structure, the design of efficient catalytic systems, the design of strategies leading to the synthesis of new materials, and the design of novel nanoscopic devices. DNA, starburst dendrimers, micelles, molecular recognition, chemical dynamics, ruthenium, metal complexes.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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AD-A251 142 CONTINUED

ROCHESTER UNIV NY DEPT OF CHEMISTRY

(U) Photon Echoes of Polyatomic Molecules in Condensed Phases, 91 13P
IDENTIFIERS: (U) WUAFOSR230383, PE61102F, *Optical echo spectroscopies, Dephasing, Quantum beats, Spectral diffusion, Four wave mixing, Femtosecond spectroscopy.

PERSONAL AUTHORS: Yan, Y. J.; Mukamel, S.

CONTRACT NO. AFOSR-90-0054

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR, XF
TR-92-0481, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Chemical Physics, v94 n1 p179-190 1991. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) A theory of optical echo spectroscopies of large polyatomic molecules in condensed phases is developed. Using phase space correlation functions, we examine the interrelationships among the following optical measurements: ordinary photon echo, stimulated photon echo, accumulated photon echo, incoherent accumulated photon echo and pump-probe absorption. Conditions for the elimination of inhomogeneous broadening in these experiments are specified. A multimode Brownian oscillator model is used to account for the high frequency molecular vibrations as well as solvent modes and electronic dephasing processes. The effects of quantum beats, spectral diffusion and homogeneous dephasing on the echo signals are studied and compared in detail with pump-probe and hole burning spectroscopy. Four wave mixing, femtosecond spectroscopy, photon echoes, pump-probe spectroscopy.

DESCRIPTORS: (U) *PHOTONS, *POLYATOMIC MOLECULES, *SPECTROSCOPY, ABSORPTION, DIFFUSION, ECHOES, FREQUENCY, FUNCTIONS, HIGH FREQUENCY, MEASUREMENT, MOLECULES, OSCILLATORS, PHASE, PROBES, PUMPS, SIGNALS, SOLVENTS, THEORY, MOLECULAR VIBRATION, REPRINTS.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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11/2 11/4 7/2

TUSKEGEE UNIV AL

(U) Development of Capability for Characterization of Ceramic/Ceramic Composites. Part 2. (High Temperature Characterization of SiCw/SiC Composites and Prediction of Flexural Properties by Energy Method).

DESCRIPTIVE NOTE: Final technical rept. 1 Dec 89-30 Nov 90,

JAN 91 48P

PERSONAL AUTHORS: Jeelani, Shaik; Mahfuz, Hassan; Haque, Anwarul; Salekeen, Sirajus

REPORT NO. TU-AFSR-2

CONTRACT NO. F49620-89-G-0016

PROJECT NO. 2302

TASK NO. BS

MONITOR: AFOSR, XF
TR-92-0455, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The fracture and flexural behavior of monolithic SiC and SiC-whisker reinforced SiC composites (SiCw/SiC) have been investigated at room and elevated temperatures. Flexure and fracture tests were conducted in a four-point beam configuration at 230C, 800 deg C and 1200 deg C to study the effects of whisker reinforcements especially in respect of mechanical and thermal stability at high energy environments. Flexural strengths and fracture toughness data within the test temperature range are presented in graphical as well as in Weibull form, and experimental observations are analyzed and discussed. Attempts have been made to predict the principle of properties of the composite by coupling the principle of minimization of potential energy and the rule of mixture. The deflection curve of a composite four-point beam coupon is found from an assumed Fourier series solution satisfying the geometric boundary conditions and using the rule of mixture. Strain compatibility conditions are applied to determine the axial displacement field and hence the flexural strain. Stresses on the matrix and

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fiber are then estimated under the assumption of isostrain conditions. Composites, Ceramics, Silicon/Carbide/Silicon Carbide, High Temperature Flexure, Fracture.

DESCRIPTORS: (U) *CERAMIC MATERIALS, *MATRIX MATERIALS, BEHAVIOR, BOUNDARIES, CARBIDES, COMPATIBILITY, CONFIGURATIONS, COUPLINGS, DEFLECTION, DISPLACEMENT, ENERGY, ENVIRONMENTS, FIBERS, FLEXURAL PROPERTIES, FOURIER SERIES, HIGH ENERGY, HIGH TEMPERATURE MIXTURES, POTENTIAL ENERGY, SILICON, SILICON CARBIDES, STABILITY, STRESSES, TEMPERATURE, TEST AND EVALUATION, THERMAL STABILITY, TOUGHNESS, MECHANICAL PROPERTIES.

IDENTIFIERS: (U) PE61102F, WUAFQSR2302BS, *Composite materials, Whisker composites, Strain.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85C05

AD-A251 073 1/3 CONTINUED

ILLINOIS INST OF TECH CHICAGO DEPT OF CIVIL ENGINEERING

(U) Fatigue, Hysteresis and Acoustic Emission. Parts 1 and 2.

FAILURE(MECHANICS), DAMAGE ASSESSMENT, STRAIN(MECHANICS), MECHANICAL PROPERTIES, LOADS(FORCES), STRUCTURAL RESPONSE.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2302C2.

DESCRIPTIVE NOTE: Final rept.,

MAY 92 176P

PERSONAL AUTHORS: Guralnick, S. A.; Erber, T.

CONTRACT NO. AFOSR-91-0136

PROJECT NO. 2302

TASK NO. C2

MONITOR: AFOSR, XF
TR-92-0453, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The basic objective of this research program is to characterize the development of material fatigue by means of stress-strain hysteresis and acoustic emission measurements. We have conjectured that the accumulation and organization of damage in material fatigue is similar to the progressive failure of structures under cyclic loading. And, specifically, that the endurance limit of a material in fatigue is the analogue of the incremental collapse load of a structure. Since the principal features of the service life and failure of structures can be completely described by hysteresis methods, it is plausible that similar means can be used to characterize the inception and organization of microplastic processes in materials. Experiments were conducted upon nearly 100 specimens made of Rimmed AISI 1018 Unannealed Steel. This material was selected because extensive data on its performance exists in the engineering literature and because its stress-strain curve is of the gradual yielding type thus mirroring at least the monotonic stress-strain behavior of many of the kinds of metals of used in the aircraft industry.

DESCRIPTORS: (U) *STEEL, *FATIGUE(MECHANICS), *HYSTERESIS, *ACOUSTIC EMISSIONS, STRESS STRAIN RELATIONS, CYCLIC LOADS, AIRCRAFT, LIFE EXPECTANCY(SERVICE LIFE).

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SEARCH CONTROL NO. T85005

AD-A251 067 7/2 7/4 9/1
WASHINGTON UNIV SEATTLE DEPT OF CHEMISTRY

(U) Spatial Inhomogeneity and Void-Growth Kinetics in the
Decomposition of Ultrathin Oxide Overlayers on Si(100).

JUN 91 5P

PERSONAL AUTHORS: Sun, Y. K.; Bonser, D. J.; Engel,
Thomas

CONTRACT NO. AFOSR-91-0123

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR, XF
TR-92-0433, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Physical Review B, v43 n17 p14,309-
14,312, 15 Jun 91. Available to DTIC users only. No
copies furnished by NTIS.

ABSTRACT: (U) Oxide layers whose thickness is 4-10
monolayers decompose inhomogeneously through void
formation in which the clean surface is exposed. No
changes take place in the oxide region during thermal
desorption until it is engulfed by the growing voids. The
kinetics of void formation has been measured with
isothermal and temperature-programmed methods. A strong
similarity to kinetic parameters determined for high-
temperature reactive scattering of atomic oxygen from
Si(100) is found. This suggests that the rate-limiting
step in void growth is oxide decomposition at the void
perimeter to produce SiO(g).

DESCRIPTORS: (U) *SILICON DIOXIDE. *OXIDATION. *THICK
FILMS. VOIDS. REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A3, Atomic oxygen,
Void growth.

AD-A251 067

AD-A251 065

UNCLASSIFIED

AD-A251 065 20/4 21/2

STANFORD UNIV CA HIGH TEMPERATURE GASDYNAMICS LAB

(U) Turbulent Reacting Flows and Supersonic Combustion.

DESCRIPTIVE NOTE: Annual technical rept. 15 Feb 91-14 Feb
92,

MAR 92 30P

PERSONAL AUTHORS: Bowman, C. T.; Hanson, R. K.; Mungal, M.
G.; Reynolds, W. C.

CONTRACT NO. AFOSR-90-0151

PROJECT NO. 3484

TASK NO. A1

MONITOR: AFOSR, XF
TR-92-0456, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) An experimental and computational
investigation of supersonic non-reacting and combustion
flows is in progress. The principal objective of the
research is to gain a more fundamental understanding of
mixing and chemical reaction in supersonic flows. The
research effort comprises three inter-related elements:
(1) an experimental study of mixing and combustion in a
supersonic plane mixing layer; (2) development of laser-
induced fluorescence techniques for time-resolved two-
dimensional imaging of species concentration, temperature,
velocity and pressure; and, (3) numerical simulations of
compressible reacting flows. The specific objectives and
the status of the research of each of these program
elements are summarized in this report.

DESCRIPTORS: (U) *TURBULENT FLOW. *REACTIVE GASES.
*SUPersonic COMBUSTION, LASER INDUCED FLUORESCENCE,
COMPRESSIBLE FLOW, JET MIXING FLOW, IMAGE PROCESSING.

IDENTIFIERS: (U) PE61103D, WUAFOSR3484A1, Computational
fluid dynamics, Reactive flow.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A251 064 7/4 20/5

AD-A251 055 7/8 7/4 20/5

OKLAHOMA STATE UNIV STILLWATER DEPT OF CHEMISTRY

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES LOKER
HYDROCARBON RESEARCH INST

(U) A Phase-Space Theory and Monte Carlo Sampling Method
for Studying Nonadiabatic Unimolecular Reactions,

(U) Synthesis and Characterization of Poly((3,4,c)furano-1-germa-1,1-dimethylcyclopentane),

FEB 92 9P

91 5P

PERSONAL AUTHORS: Marks, Alison J.; Thompson, Donald L.

PERSONAL AUTHORS: Liao, Xiuqiao; Weber, William P.;
Mazerolles, Pierre; Laurent, Christian; Faucher, Alfreda

CONTRACT NO. AFOSR-90-0048

PROJECT NO. 2303

CONTRACT NO. AFOSR-89-0007

TASK NO. FS

PROJECT NO. 2303

MONITOR: AFOSR, XF
TR-92-0434, AFOSR

MONITOR: AFOSR, XF

TR-92-0474, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. Chemical Physics, v96 n3 p1911-1918, 1 Feb 92. Available to DTIC users only. No copies furnished by NTIS.

Availability: Pub. in Polymer Bulletin, v26 p499-502 1991. Available only to DTIC users. No copies furnished by NTIS.

Reprint: A Phase-Space Theory and Monte Carlo Sampling Method for Studying Nonadiabatic Unimolecular Reactions.

ABSTRACT: (U) Poly(3,4,C)furano-1-germa-1,1-dimethylcyclopentane) (1) has been prepared by the anionic ring opening polymerization of 3-oxa-7,7-dimethyl-7-germabicyclo(3.3.0)-octa-1,4-diene (II) co-catalyzed by n-butyllithium and HMPA in THF. I has been characterized by ¹H, ¹³C NMR, IR and UV spectroscopy as well as by elemental analysis. The molecular weight distribution of I has been determined by gel permeation chromatography (GPC), its thermal stability established by thermogravimetric analysis (TGA) and its glass transition temperature (T_g) measured by differential scanning calorimetry (DSC). Poly(3,4,c)furano-1-germa-1,1-dimethylcyclopentane anionic ring opening polymerization.

DESCRIPTORS: (U) *MOLECULAR SPECTROSCOPY, NITROGEN OXIDES, ELECTRON TRANSITIONS, PROBABILITY, MONTE CARLO METHOD, ERGODIC PROCESSES, REPRINTS.

IDENTIFIERS: (U) Landau Zener transition probability, Unimolecular rate constants.

DESCRIPTORS: (U) *OPENINGS, *POLYMERIZATION, *RINGS, *ANIONS, *GERMANIUM, *FURANS, DISTRIBUTION, GELS, GLASS, MOLECULAR WEIGHT, SCANNING, SPECTROSCOPY, STABILITY, THERMAL STABILITY, TRANSITIONS, WEIGHT, REPRINTS, CATALYSIS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR230382, Polygermoxanes, Polygermaines, Polycarbogermans, *Poly(3 4 C furano-1-germa-1 1-dimethyl cyclopentane).

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AD-A251 049 6/8

EEG SYSTEMS LAB SAN FRANCISCO CA

(U) Neuro-Triggered Training.

DESCRIPTIVE NOTE: Annual rept. 1 Apr 91-31 Mar 92.

APR 92 35P

PERSONAL AUTHORS: Gevins, Alan S.; Cuttillo, Brian A.

CONTRACT NO. F49620-90-C-0026

PROJECT NO. 2313

TASK NO. BS

MONITOR: AFOSR, XF
TR-92-0451, AFOSR

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Original contains color plates: All DTIC and NTIS reproductions will be in black and white.

ABSTRACT: (U) In the past year we have made good progress in several areas: (1) most of the major software components for the Neuro-Triggered Training (TRIGGER) system have been implemented; (2) the manuscript of a detailed version of the Working Memory study has been completed for submittal to publication (see 1991 Interim Progress report for short version); (3) analysis of data from a study of linguistic and graphic processes has been completed, graphics are being produced, and a paper is being written for submittal for publication; and (4) the basic methodology of measuring inter-area functional associations is being refined using data from the language study. BRAIN ACTIVITY, COGNITION, LEARNING.

DESCRIPTORS: (U) *BRAIN, *COGNITION, *LANGUAGE, *LINGUISTICS, DOCUMENTS, GRAPHICS, METHODOLOGY, ORGANIZATIONS, PAPER.

IDENTIFIERS: (U) PE61102F, WUAFOSR231385.

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AD-A251 038 7/3

NORTH TEXAS STATE UNIV DENTON DEPT OF CHEMISTRY

(U) Synthesis and Chemistry of a New, Functionalized Polycyclic Azoalkane. A Novel Entry into the Homopentaprismane Ring System.

91 4P

PERSONAL AUTHORS: Marchand, Alan P.; Reddy, G. M.; Watson, William H.; Kashyap, Ram P.; Nagl, Ante

CONTRACT NO. AFOSR-88-0132

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR, XF
TR-92-0447, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. Organic Chemistry, v56 n1 p277-282 1991. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) As part of a general program that is concerned with the synthesis and chemistry of novel, substituted pentacycloundecanes, we have recently undertaken the synthesis of some unusual cage amines via reductive amination of pentacyclo undecane-8,11-dione and sodium borohydride and sodium cyanoborohydride reduction of PCUD-8,11-dione monobenzyllimine. Roughly spherical cage amines of this type are of interest as analogues of 1-aminoadamantane, whose activity as an antiviral and anti-Parkinsonism agent is well established.

DESCRIPTORS: (U) *CHEMICAL REACTIONS, *ORGANIC COMPOUNDS, CRYSTALLOGRAPHY, REDUCTION, REPRINTS.

IDENTIFIERS: (U) WUAFOSR2303A3, PE61102F, Polycyclic azoalkane, Homopentaprismane ring system, Pyridines.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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AD-A251 023 9/4 20/3

SMITH-KETTLEWELL EYE RESEARCH INST SAN FRANCISCO CA

CALIFORNIA UNIV BERKELEY ELECTRONICS RESEARCH LAB

(U) The Human Visual System Averages Speed Information.

(U) Nonlinear Photonics-Limits and Possibilities.

92 7P

DESCRIPTIVE NOTE: Final rept. 1 Apr 89-30 Sep 91,

PERSONAL AUTHORS: Watamaniuk, Scott N.; Duchon, Andrew

MAR 91 33P

CONTRACT NO. F49620-92-J-0156

PERSONAL AUTHORS: Gustafson, T. K.

PROJECT NO. 2313

CONTRACT NO. AFOSR-89-0340

TASK NO. AS

PROJECT NO. 2301

MONITOR: AFOSR, XF
TR-92-0452, AFOSR

MONITOR: AFOSR, XF
TR-92-0278, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

Availability: Pub. in Vision Research, v32 n5 p931-941
1992. Available to DTIC users only. No copies furnished
by NTIS.

Reprint: The Human Visual System Averages Speed
Information.

DESCRIPTORS: (U) *VISUAL PERCEPTION, *ACCELERATION,
REPRINTS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2313AS, Speed
discrimination, Global Motion.

ABSTRACT: (U) Evolving developments in fundamental
concepts, materials, and fabrication are making possible
new developments and discoveries over a broad spectrum of
the nonlinear photonic microstructure field. This
includes phenomena associated with sub-micron structures
to increase both electronic and photonic confinement,
distributed nonlinear photonic interactions in traps and
other microstructures, and nonlinear photonic
interactions in which the fully quantized nature of the
radiation field is important.

DESCRIPTORS: (U) *PHOTONICS, *ELECTRONICS, NONLINEAR
SYSTEMS, MICROSTRUCTURE, TECHNOLOGY FORECASTING, QUANTUM
ELECTRONICS.

IDENTIFIERS: (U) X Ray optics, Photorefraction, Four
wave mixing.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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AD-A251 022 CONTINUED

UNIVERSITY OF NORTH TEXAS DENTON DEPT OF CHEMISTRY

HYDROLASES, *ORGANIC MATERIALS, DIMERS.

(U) Structural Analysis and Complete Assignment of the (1)
H and (13)C NMR Spectra of Thiele's Ester,IDENTIFIERS: (U) PE81102F, WUAFOSR2303A3, *Thiele ester,
*Tetrahydro methanal ludene dicarboxylate, Chemical
structure, Reprints.

90

4P

PERSONAL AUTHORS: Minter, David E.; Marchand, Alan P.; Lu,
Shao-po

CONTRACT NO. AFOSR-88-0132

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR, XF
TR-92-0448, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Magnetic Resonance in Chemistry,
v28 p623-627 1990. Available to DTIC users only. No
copies furnished by NTIS.

ABSTRACT: (U) The H and ¹³C NMR spectra of 'Thiele's ester,' i.e. dimethyl 3 alpha, 4 alpha, 7a alpha x-tetrahydro-4,7-methano-1H-indene-2,6-dicarboxylate, have been assigned completely by using a combination of one- and two-dimensional NMR techniques. The results thereby obtained afford the first unambiguous assignment of the structure of Thiele's ester that has been made solely on the basis of NMR spectral analysis. The structure obtained is fully consistent with that of Thiele's ester established previously by chemical methods. The first dicyclopentadienedicarboxylic acid was prepared by Thiele via carbonation of cyclopentadienylpotassium. The monomeric cyclopentadienedicarboxylic acid formed initially in this reaction subsequently undergoes spontaneous Diels-Alder dimerization, thereby affording 'Thiele's acid,' C₁₄H₁₆O₄, m.p. 210 °C. Acid-catalysed esterification of this material with methanol affords the corresponding dimethyl ester ('Thiele's ester'), m.p. 85 °C. Since these compounds were first synthesized, a variety of isomeric structures have been assigned to Thiele's acid and Thiele's ester.

DESCRIPTORS: (U) *CARBOXYLIC ACIDS, *CARBOXYLIC ESTER

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A251 021 7/4

AD-A251 002 7/2 7/4 20/5

COLORADO UNIV AT BOULDER DEPT OF CHEMISTRY AND
BIOCHEMISTRY

WASHINGTON UNIV SEATTLE DEPT OF CHEMISTRY

(U) Narrow Band 1.2-2.2 Micrometers Light via CW Nd:YAG/
Dye Laser Difference Frequency Generation: Application
to the Overtone Absorption Spectrum of ArHF.

(U) The Reaction of Atomic Oxygen with Si(100) and Si(111):
1. Oxide Decomposition, Active Oxidation and the
Transition to Passive Oxidation.

91

15P

DEC 91 4P

PERSONAL AUTHORS: McIlroy, Andrew; Nesbitt, David J.
M. M.; Engel, Thomas

PERSONAL AUTHORS: Engstrom, J. R.; Bonser, D. J.; Nelson,
M. M.; Engel, Thomas

CONTRACT NO. F49620-86-C-0056

CONTRACT NO. AFOSR-91-0123

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. B3

TASK NO. A3

MONITOR: AFOSR, XF
TR-92-0443, AFOSR

MONITOR: AFOSR, XF
TR-92-0432, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

Availability: Pub. in Chemical Physics Letters, v187 n3
p215-219, 6 Dec 91. Available to DTIC users only. No
copies furnished by NTIS.

Availability: Pub. in Surface Science, v256 p317-343 1991.
Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) The generation of continuously tunable, cw
1.2-2.2 um light by the difference frequency mixing of a
cw Nd:YAG laser from a cw ring dye laser in temperature
phase matched LiNbO3 is described. The system produces on
the order of 20 uW of difference frequency light with -
250 mW of dye power and - 300 mW of Nd:YAG laser power.
The spectroscopic utility of this laser system is
demonstrated by recording the rotationally resolved HF
stretch overtone spectrum (20 DEG O) -00 DEG O0) of the
van der Waals complex ArHF in a slit jet. ArHF;
difference frequency generation; LiNbO3; near infrared;
overtones; slit expansions; van der Waals complexes.

DESCRIPTORS: (U) *RADIATION ABSORPTION, *HYDROGEN
FLUORIDE, DIFFERENCE FREQUENCY, DYE LASERS, EXPANSION,
LIGHT, MIXING, PHASE, POWER, RINGS, TEMPERATURE, VANS,
RING LASERS, NEODYMIUM LASERS, CONTINUOUS WAVE LASERS,
REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B3, Van der Waals
forces, Nd:YAG Lasers, ArHF Lasers, Overtones.

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to higher decomposition temperatures for the oxygen adlayers formed. Silicon, oxidation.

DESCRIPTORS: (U) *DECOMPOSITION, *OXIDATION, *OXIDES, *OXYGEN, *SILICON, *ATOMIC PROPERTIES, ADATOMS, ADSORPTION, BRIDGES, COEFFICIENTS, COMPETITION, DESORPTION, KINETICS, LAYERS, MASS, MEASUREMENT, MOLECULAR BEAMS, NUCLEATION, PEROXIDES, PHOTOELECTRONS, RATES, REAL TIME, SPECTROSCOPY, SURFACES, TEMPERATURE, TIME, TRANSITIONS, VOIDS, X RAY PHOTOELECTRON SPECTROSCOPY, X RAYS, MICROELECTRONICS, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A3, MMBRSC(Modulated Molecular Beam Reactive Scattering).

CALIFORNIA UNIV IRVINE

(U) Experimental Determination of Thermal and Nonthermal Mechanisms for Laser Desorption from Thin Metal Films.

OCT 90 6P

PERSONAL AUTHORS: Li, Yunzhi; McIver, Robert T., Jr.; Hemminger, John C.

CONTRACT NO. AFOSR-89-0019

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR, XF
TR-92-0439, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Chemical Physics, v93 n7 p4719-4723, 1 Oct 90. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) The mechanism of laser desorption of peptides as negative ions from Au thin films with 193, 248 and 351 nm laser radiation has been studied. Variation of the threshold laser power density with metal film thickness is used to distinguish between thermal and nonthermal mechanisms. The influence of laser wavelength on the desorption of peptides with different optical absorption spectra has been studied. Thermal desorption is observed when 351 nm laser radiation is utilized. However, both 248 and 193 nm radiation result in nonthermal desorption processes. At 248 nm, the threshold power density is observed to be independent of the optical absorption of the peptide adsorbate, supporting suggestions that a mechanism involving excitation of hot electrons in the metal is important. Laser desorption mechanisms, Multilayer films, Fourier transform mass spectrometry, Ultra thin films.

DESCRIPTORS: (U) *DESORPTION, *LASERS, *THIN FILMS, ABSORPTION, ABSORPTION SPECTRA, ADSORBATES, DENSITY, ELECTRONS, EXCITATION, FILMS, IONS, MASS, MASS SPECTROMETRY, METAL FILMS, METALS, PEPTIDES, POWER, RADIATION, SPECTRA, SPECTROMETRY, THICKNESS, VARIATIONS.

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REPRINTS.

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20/6

JOHNS HOPKINS UNIV BALTIMORE MD DEPT OF CHEMISTRY

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A2.

(U) Study of the Ca and Sr + HN3 Reactions: Indirect
Evidence for the Formation of the Metal Imides,

92 6P

PERSONAL AUTHORS: Chen, Jing; Dagdigan, Paul J.

CONTRACT NO. F49620-88-C-0056

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR, XF
TR-92-0442, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Physical Chemistry, v95 n3
p1284-1288 1992. Available only to DTIC users. No copies
furnished by NTIS.

ABSTRACT: (U) The reaction of Ca and Sr atoms with HN3
has been studied in a beam-gas configuration. Emission
from electronically excited metal atoms (1P and 3P) and
the metal hydrides (A2 Pi and B2 Sigma+) was observed.
Additional molecular chemiluminescence was also seen and
assigned to production of electronically excited MOH. By
the deliberate addition of oxygen-containing molecules,
the formation of MOH* was confirmed as being due to a
secondary reaction involving O2 impurity in the HN3
samples. In laser fluorescence experiments, ground state
MOH and MN3 were detected. An unsuccessful search for
CaNH laser fluorescence excitation was also conducted.
All of the observed emissions can be explained as arising
from secondary reactions of the metal imide (MNH) formed
in the M + HN3 primary reaction. A kinetic model is
presented to explain these observations, and it is
concluded that the M + HN3 reaction proceeds mainly by
formation of MNH, rather than MN3. Bounds on the M-NH
bond dissociation energy are also derived. Metal atom
reactions, hydrazoic acid.

DESCRIPTORS: (U) *CHEMILUMINESCENCE, *HYDRAZOIC ACID,
*METALS, *CALCIUM, *STRONTIUM, *IMIDES, ACIDS, ADDITION,

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ATOMS, CONFIGURATIONS, DISSOCIATION, EMISSION, ENERGY, EXCITATION, FLUORESCENCE, GROUND STATE, IMPURITIES, KINETICS, LASERS, MODELS, MOLECULES, OXYGEN, PRODUCTION, SECONDARY, REPRINTS, HYDRIDES, CHEMICAL REACTIONS, ALKALINE EARTH METALS.

GE AIRCRAFT ENGINES CINCINNATI OH

(U) Room Temperature Deformation in 'Soft' Orientation NiAl Single Crystals,

91

7P

IDENTIFIERS: (U) PEG1102F, WUAFOSR230381, Beam gas configurations.

PERSONAL AUTHORS: Field, R. D.; Lahrman, D. F.; Darolia, R.

CONTRACT NO. F49620-88-C-0052

PROJECT NO. 2306

TASK NO. A1

MONITOR: AFOSR, XF
TR-92-0441, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Materials Research Society Symposium Proceedings, v213 p255-260 1991. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) A detailed study of deformation of NiAl single crystals in two soft orientation, (110) and (111), has been conducted. The Schmid factor favors (100) slip in the former and (110) slip in the latter. Detailed dislocation analysis, critical resolved shear stress measurements, and slip trace analysis have been performed to determine the nature of dislocation motion and interactions in this material. Particular attention is given to prismatic loops formed during deformation, since the shapes of these loops reveal the active slip planes. Similar loop morphologies observed in elevated temperature 001 oriented tensile specimens are also discussed. Nickel Aluminate, deformation, dislocations, ductility.

DESCRIPTORS: (U) *ALUMINIDES, *DEFORMATION, *DUCTILITY, *NICKEL, *SINGLE CRYSTALS, *TEMPERATURE, ATTENTION, CRYSTALS, DISLOCATIONS, INTERACTIONS, LOOPS, MATERIALS, MEASUREMENT, MOTION, REPRINTS, SHEAR STRESSES, COMPRESSION, ELONGATION.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2306A1, *Soft orientation, Schmid factor, Slip, CRSS/Critical Resolved

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A250 996 CONTINUED
Shear Stress).

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20/4 20/2

PITTSBURGH UNIV PA DEPT OF CHEMISTRY

(U) The Synthesis and Characterization of Tribophysical
Layers on Diamond and Silicon Carbide Surfaces.

DESCRIPTIVE NOTE: Final rept. 1 May 89-31 Jan 92.

MAY 92 44P

PERSONAL AUTHORS: Yates, John T., Jr

CONTRACT NO. AF02R-89-0364

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR, XF
TR-92-0444, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) A new ultrahigh vacuum apparatus, dedicated to the study of the surface chemistry of diamond single crystals, has been completed and the first scientific experiments have been done. This apparatus incorporates XPS, LEED, ESDIAD, HREELS, and TPD facilities for the study of the fluorination and hydrogenation of diamond single crystals. The apparatus is being employed for studies of atomic hydrogen/deuterium adsorption on diamond(100) in initial experiments prior to the use of XeF2 as a fluorinating agent. It is proposed to study the formation of CHx and CFx surface species, the thermal desorption products from these species, the resistance to oxidation by these species, and the functionalization of the diamond surface by fluorinated molecules such as C2F4, NF3, and CF3CF. Collaborative AFM studies of diamond AFM tips sliding over our diamond(100) single crystal are underway, in work being done with Dr. Gary McClelland at IBM Almaden. Frictional studies completed on the non-modified surface will be compared to studies on fluorinated diamond(100).

DESCRIPTORS: (U) *ADSORPTION, *DIAMONDS, *SINGLE CRYSTALS, *SURFACE CHEMISTRY, *SILICON CARBIDES, CHEMISTRY, CRYSTALS, DESORPTION, DEUTERIUM, FACILITIES, FLUORINATION, HYDROGEN, HYDROGENATION, MOLECULES.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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OXIDATION, RESISTANCE, SLIDING, SURFACES, ULTRAHIGH
VACUUM, VACUUM, VACUUM APPARATUS, WORK,
SYNTHESIS(CHEMISTRY), THERMAL PROPERTIES, FRICTION,
METALS, COLLIMATORS, ELECTRONS, METAL CARBONYLS.

GRUMMAN AEROSPACE CORP BETHPAGE NY

(U) Highly Accurate Prediction of Unsteady Viscous Flows.

DESCRIPTIVE NOTE: Final rept. 1 Jan 91-1 Jan 92.

IDENTIFIERS: (U) WUAFOSR2303A2, PE61102F, *Tribophysical
layers, Tribochemistry.

APR 92 45P

PERSONAL AUTHORS: Marconi, F.; Moretti, Gino

CONTRACT NO. F49620-91-C-0015

PROJECT NO. 2307

TASK NO. AC

MONITOR: AFOSR, XF
TR-92-0429, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This report describes a detailed investigation of the effects of computational accuracy on the prediction of shock wave/boundary layer interaction. In particular, the result of inaccuracies in the computation of the shock and the flow in its vicinity is studied. A new computational procedure computes all shocks as discontinuities while including all viscous effects. This scheme is used as a standard against which the accuracy of widely used shock capturing schemes is measured. The effect of the numerical error generated by spreading a shock over a few mesh intervals (instead of a few mean free paths) is evaluated with regard to shock/boundary layer interaction. We consider the spreading error, as well as the error produced by reducing the formal accuracy of these schemes near shocks (in order to eliminate wiggles). In this report, we present the computational scheme and results for a number of flow configurations. Computational Fluid Dynamics, Shock Wave/Boundary Layer Interaction.

DESCRIPTORS: (U) *BOUNDARY LAYER, *SHOCK WAVES, *VISCOUS FLOW, *UNSTEADY FLOW, ACCURACY, BOUNDARIES, COMPUTATIONS, CONFIGURATIONS, DISCONTINUITIES, DYNAMICS, ERRORS, FLUID DYNAMICS, INTERACTIONS, INTERVALS, ITERATIONS, LAYERS, MEAN, MESH, NUMBERS, PREDICTIONS, STANDARDS.

IDENTIFIERS: (U) WUAFOSR2307AC, PE61102F, Computational

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A250 982 CONTINUED
fluid dynamics.

AD-A250 981 20/7

ARIZONA STATE UNIV TEMPE DEPT OF MECHANICAL AND
AEROSPACE ENGINEERING

(U) Particle Diagnostics in Optically Thick Sprays.

DESCRIPTIVE NOTE: Final rept. 15 Aug 90-29 Feb 92.

FEB 92 49P

PERSONAL AUTHORS: Hirleman, E. D.; Kenney, S. B.

CONTRACT NO. AFOSR-90-0358

PROJECT NO. 2308

TASK NO. CS

MONITOR: AFOSR, XF
TR-92-0446, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The results of a one-year research effort addressing some fundamental scientific issues relevant to particle diagnostics in optically-thick sprays are presented. The objective of this research effort involved development and application of an experimental apparatus for studying scattering in optically thick media. The important technical contributions of this project included (1) development of a fluidized bed approach for creating controlled optically thick media, and (2) characterization of performance of multi-element detectors and light-valve arrays. With respect to the former, we have developed a binary-particle-phase fluidized bed concept combined with refractive-index matching that will allow the bed to be fluid-dynamically very dense (with interparticle spacings on the order of two diameters as required for stable operation) but optically less thick (with interparticle spacings greater than five diameters where independent, as opposed to dependent, multiple scattering is in effect). Conditions for stable operation of the binary-particle-phase fluidized bed have been identified. Regarding detector and light-valve arrays, the experimental results indicated that edge effects are important and that current-generation Faraday-effect light valve arrays do not have the performance specifications required for use in multi-angle interrogation schemes for diagnostics in

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optically thick sprays. Particle Sizing, Droplet Sizing, Sprays, Light Scattering, Multiple Scattering, Optical Diagnostics, Optical Sensors.

CORNELL UNIV ITHACA NY LAB OF ATOMIC AND SOLID STATE PHYSICS

(U) High Translational Energy Induced Reaction in Semiconductors.

DESCRIPTORS: (U) *LIGHT SCATTERING, *FLUID DYNAMICS, *FLUIDIZED BED PROCESSES, ADDRESSING, ANGLES, APPROACH, ARRAYS, DETECTORS, DIAMETERS, EDGES, FARADAY EFFECT, FLUIDS, INDEXES, INTERROGATION, LIGHT, MATCHING, MEDIA, OPERATION, PARTICLES, PHASE, REFRACTIVE INDEX, SCATTERING, SPECIFICATIONS, SPRAYS, VALVES, DROPS.

DESCRIPTIVE NOTE: Final rept. 1 Aug 88-30 Nov 91,

MAY 92 8P

PERSONAL AUTHORS: Ho, Wilson

CONTRACT NO. AFOSR-88-0335

PROJECT NO. 2306, 2303

TASK NO. B1, A2.

MONITOR: AFOSR, XF
TR-92-0445, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The main objectives of this project are to develop novel instrumentation and to understand bond breaking and formation on semiconductor surfaces. The approaches used in achieving these objectives are to determine the dependence of adsorption on the translational and vibrational energies of incident molecules and to investigate energy exchange at surfaces. The systems which have been investigated in detail are the dissociative adsorption of carbon dioxide and the nondissociative adsorption of ethane on silicon surface. For these experiments a unique differentially pumped, time-resolved spectrometer, a molecular beamline, and a ultrahigh vacuum chamber with surface instrumentation were designed and constructed. Molecular Beam, EELS, Silicon, Chemistry, in-situ Probe, Dissociative Sticking, Nanodissociative Sticking, Bond Activation.

DESCRIPTORS: (U) *ADSORPTION, *SEMICONDUCTORS, *CHEMICAL BONDS, *ELECTRONIC STATES, CARBON DIOXIDE, CHAMBERS, ENERGY, ENERGY TRANSFER, ETHANES, EXCHANGE, INSTRUMENTATION, MOLECULAR BEAMS, MOLECULES, PROBES, SILICON, SPECTROMETERS, SURFACES, TIME, ULTRAHIGH VACUUM, VACUUM CHAMBERS.

IDENTIFIERS: (U) WUAFQSR230681, WUAFQSR2303A2, PE61102F.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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GEORGETOWN UNIV WASHINGTON DC DEPT OF CHEMISTRY

GE AIRCRAFT ENGINES CINCINNATI OH

(U) Development of Effective Quantum Chemical Method for Polymers and Solid.

(U) The Effect of Alloying on Slip Systems in (001) Oriented NiAl Single Crystals.

DESCRIPTIVE NOTE: Final rept. Dec 88-Nov 91,

91 10P

MAY 92 9P

PERSONAL AUTHORS: Kertesz, M.
R. Field, R. D.; Lahrman, D. F.; Darolia,

PERSONAL AUTHORS: Kertesz, M.

CONTRACT NO. AFOSR-89-0229

CONTRACT NO. F49620-88-C-0052

PROJECT NO. 2303

PROJECT NO. 2306

TASK NO. 83

TASK NO. A1

MONITOR: AFOSR, XF
TR-92-0457, AFOSRMONITOR: AFOSR, XF
TR-92-0440, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Applications of the chemical-molecular viewpoint in the calculation of properties of polymeric systems proved very fruitful in this project. In the area of methodology, we have perfected the band theory code MOSOL, which is based on the semiempirical MNDO (and its closely related versions, AM1 and PM3) all developed with some AFOSR support. In the course of this work we have included a screw axis of symmetry for polymers; extended the method to metallic systems and improved the convergence of the calculations. We have introduced methodology applicable to a wide class of polymers and properties based on the oligomer approach. We have developed a new analytical theory for the calculation of the elastic modulus, γ , of polymers.

DESCRIPTORS: (U) *METHODODOGY, *SOLIDS, *QUANTUM CHEMISTRY, *POLYSILANES, APPROACH, CHEMICALS, CONVERGENCE, OLIGOMERS, POLYMERS, SCREWS, SYMMETRY, THEORY, WORK, BAND THEORY OF SOLIDS, STRUCTURAL ANALYSIS, INTENSITY, ELECTROCHEMISTRY, ENERGY GAPS, MODULUS OF ELASTICITY, CARBON, MECHANICAL PROPERTIES.

IDENTIFIERS: (U) PE61102F, WUAFOSR230383, Conformational energetics, Vibrational frequencies, Linear optical spectra, Nonlinear optical spectra, Ab initio calculation, MOSOL Computer program, Screw axis.

AD-A250 978

AD-A250 973

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35005

Availability: Pub. in Acta Metall. Mater., v39 n12 p2961-2969 1991. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) An investigation of the effect of alloying on slip behavior in NiAl as a function of temperature has been conducted. Single crystal specimens have been deformed in tension and compression in (110) and (001) orientations. It was found that the addition of Cr and other alloying additions promote the activation of (111) slip over deformation by kinking in NiAl based alloys. This is believed to result from differential proportional hardening of the (100) vs. (111) slip systems. No increase in RT tensile elongation is observed in these alloys. Increased tensile ductility observed at higher temperatures is due to the movement of $b = (110)$ dislocations. Nickel Aluminide, deformation, dislocations, ductility.

DESCRIPTORS: (U) *ALLOYS, *ALUMINIDES, *NICKEL, *SINGLE CRYSTALS, *ALUMINUM, ACTIVATION, ADDITION, BEHAVIOR, COMPRESSION, CRYSTALS, DEFORMATION, DISLOCATIONS, DUCTILITY, ELONGATION, FUNCTIONS, HARDENING, TEMPERATURE, TENSION, REPRINTS, SHEAR STRESSES, CHROMIUM, TITANIUM, ZIRCONIUM.

IDENTIFIERS: (U) PE61102F, WUAFOSR2306A1, *Slip systems.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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Schmid factor, CRSS(Critical Resolved Shear Stress),
Kinking, Slip bands, Plastic strain.

FLORIDA AGRICULTURAL AND MECHANICAL UNIV TALLAHASSEE
DEPT OF PHYSICS

(U) Semianalytic Method for Four-Center Molecular
Integrals Over Slater-Type Orbitals.

MAY 92 7P

PERSONAL AUTHORS: Jones, H. W.

CONTRACT NO. F49620-92-J-0063, F49620-89-C-0007

PROJECT NO. 2303

TASK NO. FS

MONITOR: AFOSR, XF
TR-92-0458, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in International Jnl. of Quantum
Chemistry, v42 779-784 1992. Available only to DTIC users.
No copies furnished by NTIS.

ABSTRACT: (U) A strategy for the evaluation of four-
center molecular integrals over Slater-type orbitals is
developed using the Lowdin a-function approach in which
displaced orbitals are expanded in spherical harmonics.
The harmonic potentials are produced analytically and
evaluated along a grid. The harmonic charge distributions
are given an analytical formulation and are evaluated
over the common grid, and the numerical integrations are
performed for each harmonic. Using an example with 1s
orbitals, only nine harmonics are needed for good results.
Computer algebra and integer arithmetic are used to
generate C, E, and F matrices that are stored as part of
the data base. One-dimensional T and X matrices are
introduced as an aid in computation. The employment of
look-up tables and vector and parallel processing
promises to make this method, which can be generalized,
practical.

DESCRIPTORS: (U) *INTEGRALS, *PARALLEL PROCESSING,
*HARMONIC ANALYSIS, ALGEBRA, APPROACH, ARITHMETIC,
COMPUTATIONS, COMPUTERS, DATA BASES, EMPLOYMENT,
FORMULATIONS, FUNCTIONS, GRIDS, HARMONICS, ONE
DIMENSIONAL, PROCESSING, STRATEGY, REPRINTS.

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JOINT INST FOR LAB ASTROPHYSICS BOULDER CO

IDENTIFIERS: (U) PE61102F, WUAFOSR2303FS, Four center
molecular orbitals, Slater type orbitals.

(U) Metastable (3)Sigma sub g(-) Ground State of F2(++)
and the Bonding in Molecular Dications,

AUG 91 7P

PERSONAL AUTHORS: Senekowitsch, Joerg; ONeil, Stephen V.

CONTRACT NO. AFOSR-89-0074

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR, XF
TR-92-0463, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Chemical Physics, v95 n3
p1847-1851, 1 Aug 91. Available to DTIC users only. No
copies furnished by NTIS.

ABSTRACT: (U) Large multireference configuration
interaction (MR-CI) calculations on the F2++ ion predict
a 3/Eg ground state, metastable with respect to tunneling
into the F+ + F+ nuclear continuum. The potential energy
curve displays a 0.40 eV barrier at Rb = 1.607 A, between
the local potential minimum (Re = 1.289 A) and the 3Pg(F+)
+ 3Pg(F+) asymptote at 7.69 eV lower energy. The
potential barrier traps four quasibound vibrational
levels, with a tunneling lifetime of 16 ms for v = 0. A
Dunham analysis at the well minimum gives we=919.4 cm-1,
wexe = 16.31 cm-1, Be = 1.073 cm-1, and alpha e = 0.0316
cm-1. In a departure from an earlier viewpoint, the
origin of the barrier in this and other dications is
interpreted as a sum of the e2/R Coulomb repulsion and
the ordinary chemical bonding of the constituent ions.
This model also explains the purely repulsive character
found for the valence-excited 1 delta g and 1 Sigma +
states.

DESCRIPTORS: (U) *BONDING, *GROUND STATE, *MOLECULAR
IONS, *METASTABLE STATE, *FLUORINE, AVAILABILITY,
BARRIERS, CHEMICALS, CONFIGURATIONS, DELTAS, ENERGY, IONS,
MODELS, PHYSICS, POTENTIAL ENERGY, THEORY, TRAPS,
TUNNELING, VALENCE, REPRINTS, MOLECULAR VIBRATION,

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HARTREE FOCK APPROXIMATION.

TEXAS CHRISTIAN UNIV FORT WORTH DEPT OF PHYSICS

IDENTIFIERS: (U) Bonding, F2++, Molecular ion, Ab initio, Theory; Calculations, PE61102F, WUAFOSR2303B1, *Dications, MRCI(Multireference Configuration Interaction) calculations, Ab initio calculations, VTValence Triple Zeta).

(U) Molecular Dynamics of SF6 in Porous Silica,

SEP 91 10P

PERSONAL AUTHORS: Brodka, A.; Zerda, T. W.

CONTRACT NO. AFOSR-90-0165

PROJECT NO. 3484

TASK NO. CS

MONITOR: AFOSR, XF
TR-92-0462, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Chemical Physics, v95 n5 p3710-3718, 1 Sep 91. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) Molecular dynamics of SF6 in small cylindrical pores in amorphous silica is studied by computer simulations. The solid is represented by an atomic model that takes into account microscopic structure of the surface. Adsorbent is modeled as an assembly of six Lennard-Jones potentials. Rotational and translational correlation functions are calculated and discussed in terms of temperature, density, pore diameter, and surface potential. Changes in the motion along the pore axis and pore radius are analyzed. It is shown that surface interactions determine translational and rotational diffusion of molecules in the monolayer, but at distances greater than two molecular diameter the dynamics can be compared to that in the bulk liquid.

DESCRIPTORS: (U) *DYNAMICS, *MOLECULES, *STRUCTURES, ADSORBENTS, ASSEMBLY, AVAILABILITY, CHEMICALS, COMPUTERS, CORRELATION, DENSITY, DIAMETERS, DIFFUSION, FUNCTIONS, GELS, INTERACTIONS, LIQUIDS, MODELS, MOTION, PHYSICS, SIMULATION, SOLIDS, SURFACES, TEMPERATURE, REPRINTS.

IDENTIFIERS: (U) Silica, Sol-gel, Molecular simulations, PE61103D, WUAFOSR3484CS.

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TEXAS CHRISTIAN UNIV FORT WORTH DEPT OF PHYSICS

CALIFORNIA UNIV BERKELEY DEPT OF INDUSTRIAL ENGINEERING
AND OPERATIONS RESEAR CH

(U) Molecular Motion in Porous Silica.

(U) Stochastic Models in Reliability.

91 8P

DESCRIPTIVE NOTE: Final rept. 1 Oct 90-30 Sep 91.

PERSONAL AUTHORS: Nikiel, L.; Zerda, T. W.; Hensch, L. L.

CONTRACT NO. AFOSR-90-0185

PERSONAL AUTHORS: Ross, Sheldon M.

PROJECT NO. 3484

CONTRACT NO. AFOSR-91-0019

TASK NO. CS

MONITOR: AFOSR, XF

TR-92-0461, AFOSR

TR-92-0428, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

Availability: Pub. in Advanced Composite Materials, p189 - 105 1991. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) Rotational relaxation of SF6, CS2, CHCl3, and CH3CN is studied inside porous silica of average pore diameter of 24A. Rotational correlation function and correlation times are determined using Raman spectroscopy. It is shown that hydrogen bond interactions play dominant role in slowing down molecular reorientation, especially in the first monolayer.

DESCRIPTORS: (U) *COMPOSITE MATERIALS, *HYDROGEN BONDS, *RAMAN SPECTROSCOPY, AVAILABILITY, CORRELATION, DIAMETERS, FUNCTIONS, GELS, HYDROGEN, INTERACTIONS, MATERIALS, MOTION, RECREATION, RELAXATION, SPECTROSCOPY, MOLECULAR VIBRATION, REPRINTS.

IDENTIFIERS: (U) Silica, Sol-gel, Molecular motion, PE81103D, WUAFOSR3484CS.

ABSTRACT: (U) Two approaches for simulating the reliability function are considered - one using the total hazard estimator and the other using importance sampling. It is shown both for the Wheatstone Bridge system and also for a triangular system that the total hazard estimator has significantly smaller variance when compared both to the standard importance sampling estimator and also to an improved version of it.

DESCRIPTORS: (U) *ESTIMATES, *STOCHASTIC PROCESSES, ABSTRACTS, APPROACH, BRIDGES, FUNCTIONS, HAZARDS, MODELS, RELIABILITY, SAMPLING, STANDARDS, STATISTICAL SAMPLES.

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20/5 20/8

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PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF
CHEMISTRYat 1300 deg C for 10 h leads to the production of
crystalline hexagonal boron nitride.(U) Synthesis and Structure of Boraziny]-Substituted Small-
Molecule and High Polymeric Phosphazenes: Ceramic
Precursors,

92 13P

PERSONAL AUTHORS: Allcock, Harry R.; Welker, Mark F.;
Parvez, Masood

CONTRACT NO. AFOSR-89-0234

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR, XF
TR-92-0460, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Chemistry of Materials, v4 n2 p296-
307 1992. Available to DTIC users only. No copies
furnished by NTIS.

ABSTRACT: (U) Mixed-substituent small-molecule cyclic
and high molecular weight polymeric (borazinylamino)
phosphazenes have been prepared by reactions between
aminophosphazenes and chloroborazines as well as between
chlorophosphazenes and aminoborazines. A single-crystal X-
ray diffraction study of a small-molecule model compound,
gem-bis(borazinylamino)cyclotriphosphazene, N3P3(NH₂)₂
4(NH₂CH₂CH₂Me)₂ (10), is reported: triclinic, space group
P1, a = 9.424 (2) Å, b = 13.841 (1) Å, c = 14.570 (4) Å,
79.40 (1)°, = 73.99 (1)°, V = 1791.5 Å³, Z = 2, D_c = 1.
187 g cm⁻³, Mo Kα radiation, X = 0.710 73 Å, u = 0.196 mm⁻¹, R = 0.066. The exocyclic P-N
and B-N bond lengths of the borazinylamino substituents
indicate significant delocalization of the nitrogen atom
lone pair, with preference into the borazinyl ring rather
than the phosphazene ring. Pyrolysis studies of the mixed-
substituent (borazinylamino)phosphazene polymers indicate
that these polymers are potential precursors to new
ceramic materials, with up to 57% ceramic yield when
heated to 1000 deg C under nitrogen. Continued pyrolysis

DESCRIPTORS: (U) *CERAMIC MATERIALS, *PHOSPHAZENE,
*POLYMERS, *STRUCTURES, *SYNTHESIS, ATOMS, AVAILABILITY,
BORON, BORON NITRIDES, CHEMISTRY, CRYSTALS, DIFFRACTION,
MATERIALS, MODELS, MOLECULAR WEIGHT, MOLECULES, NITRIDES,
NITROGEN, PRECURSORS, PRODUCTION, PYROLYSIS, RADIATION,
RINGS, SINGLE CRYSTALS, WEIGHT, X RAY DIFFRACTION, X RAYS,
YIELD, REPRINTS, SILICON, CROSSLINKING(CHEMISTRY),
CONDENSATION.

IDENTIFIERS: (U) Phosphazenes, Polymers,
Polyphosphazenes, Borazinyl, Materials, Pre ceramic, X-ray
diffraction study, PEG1102F, WJAFOSR2303B2, *Small
molecules, *Corazinylphosphazenes, Polyphosphazenes.

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OHIO STATE UNIV COLUMBUS

IDENTIFIERS: (U) PSE(Parabolized Stability Equations).

(U) Stability of Boundary Layers at High Supersonic and Hypersonic Speeds.

DESCRIPTIVE NOTE: Final rept. 30 Jun-31 Oct 91.

MAY 92 24P

PERSONAL AUTHORS: Herbert, Thorwald

CONTRACT NO. F49620-88-C-0082

PROJECT NO. 2307

TASK NO. AS

MONITOR: AFOSR, XF
TR-92-0416, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The thrust of this research program has been the improvement of our capabilities for analyzing stability and transition of boundary layers at supersonic speeds. During the first phase, our efforts were primarily directed toward analytical studies, establishing the elements of the numerical approach, and evaluating existing and new concepts to tackle the variety of problems. The second, and final, phase has been devoted to combining selected elements into codes, verification of these codes, comparison with previous results, and computing the basic flow over realistic geometries. The latter task has consumed the bulk of our resources. Analytical and numerical studies have been performed to investigate the role of the shock on both stability and receptivity characteristics of the flow. Development of the parabolized stability equations (PSE) for compressible flows has been a major goal. A new code incorporating many of the latest concepts and open to extensions is largely completed. Parabolized Stability Equations, Compressible Flow.

DESCRIPTORS: (U) *COMPRESSIBLE FLOW, *BOUNDARY LAYER TRANSITION, *SUPersonic FLOW, COMPARISON, EQUATIONS, HOISTS, LAYERS, PHASE, SHOCK, STABILITY, THRUST, VELOCITY, VERIFICATION, HYPERSONIC FLOW.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A250 898 20/4

AD-A250 896 8/10

CAMBRIDGE UNIV (UNITED KINGDOM) DEPT OF ENGINEERING

CASE WESTERN RESERVE UNIV CLEVELAND OH

(U) Feedback Stabilization Hydrodynamic Instabilities

(U) Crack Propagation and Fabric Control on the Static and Dynamic Strength of Cohesive Soils.

DESCRIPTIVE NOTE: Final rept. 1 Aug 89-31 Jul 91,

DESCRIPTIVE NOTE: Final rept. 1 Jun 88-31 Jan 92,

DEC 91 115P

JAN 92 286P

PERSONAL AUTHORS: Gaster, M.

PERSONAL AUTHORS: Saada, Adel S.; Bianchini, Gary F.

CONTRACT NO. AFOSR-89-0519

REPORT NO. AF-SFRAC-1

PROJECT NO. 2307

CONTRACT NO. AFOSR-88-0169

TASK NO. BS

PROJECT NO. 2302

MONITOR: AFOSR, XF
TR-92-0364, AFOSR

UNCLASSIFIED REPORT

TASK NO. CS

MONITOR: AFOSR, XF
TR-92-0362, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The stabilization of boundary layers via control compared to passive boundary layer control techniques. To date, all experimental disturbances in the laminar boundary layer. To further improve the level of disturbance attenuation in the boundary layer requires an inherently three dimensional approach. The goal of this study was to control the boundary layer response to random three dimensional disturbances introduced near the leading edge of a flat plate. This goal was not fully achieved in the shortened time frame of this investigation. The basic flow structure to be controlled is the three-dimensional wave packet, i.e. the boundary layer response to localized pulse excitation. Since the control is to take place in the linear region of the transition zone, any conceivable flow disturbance can be synthesized and hence cancelled by appropriate wave packet superposition. boundary layer, turbulent flow, transition.

DESCRIPTORS: (U) *BOUNDARY LAYER, *TURBULENT FLOW, *BOUNDARY LAYER TRANSITION, BOUNDARIES, BOUNDARY LAYER CONTROL, EDGES, EXCITATION, FLOW, FRAMES, LAMINAR BOUNDARY LAYER, LAYERS, LEADING EDGES, PACKETS, PLATES, PULSES, RESPONSE, THREE DIMENSIONAL, TIME, TRANSITIONS, WAVE PACKETS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2307BS.

AD-A250 898

ABSTRACT: (U) Discontinuities in the form cracks or fissures and inclusions are often present in natural clays. They serve as stress concentrators when loads are applied to the material. Such concentrations result in the cracks advancing, often surrounded and preceded by a propagating damage zone. As the crack propagates, the damage may be in the form of one or more shear bands, which may play the part of new stress concentrators and blunt the action of the original crack. This report examines some of the phenomena associated with the presence of cracks in overconsolidated clays as well as in the less brittle normally consolidated clays. Differences between isotropic and anisotropic materials, and the level at which serious modifications take place in the fabric of the material are noted. Observations made with a surface analyzer as well as with a transmission electron microscope indicate that the changes in fabric mostly occur at the level of the cluster or flock. The influence of the cracks and of the shear bands on the kinematics and strength of the test specimens is studied and discussed. Clay, Fracture, Fabric, Anisotropy, Damage, Crack propagation, Strength.

DESCRIPTORS: (U) *CLAY, *CRACK PROPAGATION, *SOIL

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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MECHANICS, *COHESIVE SOILS, *STRESS ANALYSIS, ANALYZERS, ANISOTROPY, CRACKS, DAMAGE, DISCONTINUITIES, ELECTRON MICROSCOPES, INCLUSIONS, KINEMATICS, SURFACES, TEST AND EVALUATION, STRENGTH(MECHANICS), SATURATED SOILS, SHEAR STRESSES, STATIC LOADS, DEFORMATION, BIFURCATION(BIOLOGY), MECHANICAL PROPERTIES, PORE PRESSURE, LABORATORY TESTS, FINITE ELEMENT ANALYSIS.

MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF MECHANICAL ENGINEERING

(U) 3-D Analysis and Verification of Fracture Growth Mechanisms in Fiber-Reinforced Ceramic Composites.

DESCRIPTIVE NOTE: Final rept. 31 Oct 88-30 Sep 91,

IDENTIFIERS: (U) PEG1102F, WUAFOSR2302CS, Soil fabric, Principal stress, Shear bands.

MAR 92 28P

PERSONAL AUTHORS: Cleary, M. P.; Larson, M. C.; Keat, W. D.; Patterson, F. T.

CONTRACT NO. AFOSR-89-0005

MONITOR: AFOSR, XF
TR-92-0417, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This final report documents a 3-D computational and experimental investigation into the mechanics of toughening a brittle matrix by incorporating long brittle fibers. Computationally, small scale failure mechanisms ahead of a crack are explicitly modeled and merged with a continuum representation of the far field outside the process zone. Particular attention is given to the interfacial decohesion and frictional slipping near the tip of a matrix crack which is impinging upon an inclusion. The surface integral and finite element (SIFEH) method, which employs the principle of superposition to combine the best features of two powerful numerical techniques, provides an extremely flexible and efficient computational platform for modeling linear elastic fractures near material inhomogeneities. Applications to general 3-D fracture growth in multilayered media demonstrate the capabilities of the computational technique and are also described. The computational simulation is being guided by laboratory experiments. Crack growth observations made on a model (microstructure) matrix show the toughening mechanisms of crack pinning and crack bridging in operation. In a second experiment, interfacial slip evolution was modeled experimentally for planar bimaterial interfaces. This combined experimental and numerical program is providing insight into optimal combinations of the key parameters (e.g. residual stresses at interface, friction coefficient, strength of

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fibers) to maximize toughness. Fracture Mechanics; Fiber-Reinforced Composites; Ceramic Composite Materials; Surface-Integral Method.

DESCRIPTORS: (U) *FIBER REINFORCED COMPOSITES, *FRACTURE(MECHANICS), *CERAMIC MATRIX COMPOSITES, CEMENTS, COMPOSITE MATERIALS, CRACKS, FAR FIELD, FIBERS, FRICTION, GLASS, INCLUSIONS, INTEGRALS, INTERFACES, PLATFORMS, RODS, SIMULATION, STRESSES, STRUCTURES, SURFACES, TOUGHNESS, BRITTLENESS, CRACK PROPAGATION, MATHEMATICAL MODELS, FINITE ELEMENT ANALYSIS, STRENGTH(MECHANICS), FAILURE(MECHANICS).

IDENTIFIERS: (U) Superposition.

ALABAMA UNIV IN HUNTSVILLE

(U) International Conference on Partitioning in Aqueous Two-Phase Systems in Biochemistry Cell Biology and Biotechnology (7th) Held in New Orleans, Louisiana on June 2-7, 1991.

DESCRIPTIVE NOTE: Final rept. 1 Jun-30 Nov 91.

NOV 91 115P

PERSONAL AUTHORS: Harris, Milton

CONTRACT NO. AFOSR-91-0284

PROJECT NO. 2303, 2312

TASK NO. 82, A5

MONITOR: AFOSR, XF
TR-92-0426, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The 7th International Conference on Partitioning in Aqueous Two-Phase Systems: Advances in Separation in Biochemistry, Cell Biology and Biotechnology was held 2-7 June, 1991, in New Orleans, Louisiana. Major themes of conference included: Partitioning of Macromolecules, Biotechnical Applications of Partitioning, Partitioning of Cells and Fragments, Biotechnical Applications of PEG Chemistry, Theory of Partitioning and Characterization of Phase Behavior, Gravitational Effects of Separation Related Processes, Polymer-Protein and Polymer-Surface Interactions, Novel and Complementary Techniques, abstracts of all papers are included in report.

DESCRIPTORS: (U) *BIOCHEMISTRY, *SEPARATION, ABSTRACTS, BIOLOGY, BIOTECHNOLOGY, CHEMISTRY, FRAGMENTS, INTERACTIONS, PHASE, POLYMERS, PROTEINS, SURFACES, THEORY, MACROMOLECULES, CELLS(BIOLOGY), GRAVITY, SYMPOSIA.

IDENTIFIERS: (U) PE61102F, WUAFOSR2312A5, WUAFOSR230382, Cell biology, *Partitioning, Phase behavior, *Aqueous polymer.

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PURDUE UNIV LAFAYETTE IN SCHOOL OF MECHANICAL
ENGINEERING

(U) Research on Aero-Thermodynamic Distortion Induced
Structural Dynamic Response of Multistage Compressor
Blading.

* ROTOR BLADES, * THERMODYNAMICS, APPROACH, BLADES,
COMPRESSORS, CONTRACTS, DISTORTION, DYNAMICS, ENGINES,
ENVIRONMENTS, FLOW, FREQUENCY, FUNCTIONS, GAS TURBINES,
INTERACTIONS, PHYSICS, RESPONSE, ROTORS, STATORS, TIME,
TURBINES, VALUE, VIBRATION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2307DS, * Unsteady
aerodynamics.

DESCRIPTIVE NOTE: Final rept. Nov 87-May 91,

MAR 92 220P

PERSONAL AUTHORS: Fleeter, Sanford

REPORT NO. TSPC-TR-92-10

CONTRACT NO. F49620-88-C-0022

PROJECT NO. 2307

TASK NO. DS

MONITOR: AFOSR, XF
TR-92-0403, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This report summarizes the results obtained on Contract F49620-88-C-0022. The overall objective of this basic research program was the quantitative investigation of the fundamental phenomena relevant to aero-thermodynamic distortion induced structural dynamic blade responses in multistage gas turbine engines. The technical approach involved unique benchmark experiments and also analyses. In particular, the flow physics of multistage blade row interactions were investigated, with unique unsteady aerodynamic data obtained and analyses developed to understand, quantify, and discriminate the fundamental flow phenomena as well as to direct the modeling of advanced analyses. Data obtained define the flow interactions and the effects on both the aerodynamic forcing function and the resulting unsteady aerodynamics of compressor rotor blades and stator vanes in a multistage environment over a wide range of realistic reduced frequency values for the first time. Unsteady Aerodynamic, Flow Induced Vibrations, Forced Response.

DESCRIPTORS: (U) * AERODYNAMICS, * COMPRESSOR ROTORS,

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AD-A250 864 13/13 11/4 20/11 12/2
 HOWARD UNIV WASHINGTON DC DEPT OF MECHANICAL ENGINEERING

AD-A250 853 9/5 9/3
 NEW MEXICO UNIV ALBUQUERQUE CENTER FOR HIGH TECHNOLOGY MATERIALS

(U) Eigensensitivity Analysis of Composite Laminates:
 Effect of Microstructure.

DESCRIPTIVE NOTE: Final rept. 1 Nov 89-31 Oct 90.

DESCRIPTIVE NOTE: Final rept. 15 May 89-14 Mar 92.

FEB 92 77P

APR 92 35P

PERSONAL AUTHORS: Reiss, Robert; Broome, Taft H.

PERSONAL AUTHORS: Brueck, S. R.

CONTRACT NO. F49620-89-C-0003

CONTRACT NO. AFOSR-89-0337

MONITOR: AFOSR, XF
 TR-92-0401, AFOSR

TASK NO. AS

PROJECT NO. 2301

PROJECT NO. 2301

UNCLASSIFIED REPORT

ABSTRACT: (U) The purpose of this research is to develop new methods to determine how the frequency of laminates depends upon the microstructure of each individual layer. Toward this end, modern methods of sensitivity analysis are employed to develop new closed-form representations for the frequency response of laminates, where the governing eigenvalue equation is represented either in distributed parameter or discrete form. Solutions are obtained for both damped and undamped structures in terms of the aggregate micromechanical properties (stiffnesses and damping coefficients). Thus the solutions are valid for all micromechanical models of the microstructure. One new method for determining the effective stiffness and mass properties of the laminate - the Load Correction Method - is developed in detail and some of the computational issues associated with this method are discussed. Frequency analysis, composite laminates, damped structures, load correction method.

DESCRIPTORS: (U) *DAMPING, *FREQUENCY RESPONSE, *LAMINATES, *STRUCTURAL COMPONENTS, *CONTINUUM MECHANICS, CORRECTIONS, EIGENVALUES, EQUATIONS, FREQUENCY, LAYERS, MASS, MICROSTRUCTURE, MODELS, PARAMETERS, RESPONSE, STIFFNESS, STRUCTURES, SENSITIVITY, LATTICE DYNAMICS, SPACE BASED, STRUCTURAL RESPONSE.

IDENTIFIERS: (U) Micrometers, Load correction method.

AD-A250 864

UNCLASSIFIED

UNCLASSIFIED REPORT

ABSTRACT: (U) The Laser-Materials Interaction Laboratory at the Center for High Technology Materials of the University of New Mexico is devoted to the study of a broad range of laser spectroscopic probes of semiconductor and nonlinear materials, fabrication processes and optoelectronic devices. Much of this work is being carried out in conjunction with the Optoelectronics Research Center Program at CHTM, which is also partially funded by the Air Force Office of Scientific Research. Significant progress has been made during this reporting period in a number of areas including: ultrafast operation of optically-pumped resonant periodic-gain GaAs surface-emitting lasers; grating coupling to surface-plasma waves; nonlinear optics of PLZT films and SiO₂, and confocal microscopy for the direct measurement of semiconductor transport parameters. Optoelectronic devices, laser spectroscopic probes of semiconductor and nonlinear materials.

DESCRIPTORS: (U) *LASER MATERIALS, *NONLINEAR OPTICS, *SEMICONDUCTORS, AIR FORCE, COUPLINGS, FABRICATION, INTERACTIONS, MEASUREMENT, MICROSCOPY, OPTICS, PLASMA WAVES, PROBES, SURFACES, GALLIUM ARSENIDES, OPTICAL PUMPING, GRATINGS(SPECTRA).

IDENTIFIERS: (U) WUAFOSR2301AS, Silicon oxides.

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AD-A250 835 20/6 20/14 9/1

PRINCETON UNIV NJ DEPT OF ELECTRICAL ENGINEERING AND
COMPUTER SCIENCE

Spectroscopic probes. *Optoelectronic devices.

(U) Submillimeter Wave Spectroscopy of Heterojunction
Superlattices.

DESCRIPTIVE NOTE: Final technical rept. 1 Oct 90-30 Sep
91.

APR 92 11P

PERSONAL AUTHORS: Tsui, D. C.

CONTRACT NO. AFOSR-88-2048

PROJECT NO. 2305

TASK NO. C1

MONITOR: AFOSR, XF
TR-92-0304, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The general objectives of this research are to systematically investigate the interaction of electromagnetic radiation in the far infrared range with the charge carriers in semiconductor heterojunction superlattice structures. Experiments are performed on both the lattice-matched GaAs/Al sub xGa sub 1-xAs/GaAs heterojunction material structures and the strained-layer material of In sub xGa sub 1-xAs/GaAs heterostructure. In the former case, new electronic processes are discovered and their possible detector application is explored. In the latter case, the energy level structure is determined and the carrier dynamics are studied using the submillimeter wave spectroscopy.

DESCRIPTORS: (U) *ELECTROMAGNETIC RADIATION,
*SUPERLATTICES, *FAR INFRARED RADIATION, CHARGE CARRIERS,
DETECTORS, DYNAMICS, ELECTRONICS, ENERGY, ENERGY LEVELS,
HETEROJUNCTIONS, INTERACTIONS, LAYERS, MATERIALS,
RADIATION, SEMICONDUCTORS, SPECTROSCOPY, STRUCTURES,
SUBMILLIMETER WAVES.

IDENTIFIERS: (U) WUAFOSR230505C1. *Submillimeters wave
spectroscopy.

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AD-A250 789 11/6.1 7/4 20/2 20/13

MISSOURI UNIV-COLUMBIA DEPT OF STATISTICS

(U) Statistical Theory on Reliability.

DESCRIPTIVE NOTE: Final rept. 15 Jun 89-14 Dec 91,

DEC 91 8P

PERSONAL AUTHORS: Basu, Asit P.

CONTRACT NO. AFOSR-89-0406

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR, XF
TR-92-0358, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Considerable progress was made by the Principal Investigator Professor Asit Basu and his collaborators on the areas of tests for exponentiality, component life length estimation, sequential and influential methods, and Bayesian approaches for repairable systems. All of these results contribute to a better understanding of reliability principles and better techniques for applied reliability practice.

DESCRIPTORS: (U) *RELIABILITY, *STATISTICAL ANALYSIS, *THEORY, APPROACH, LENGTH, TEST AND EVALUATION.

IDENTIFIERS: (U) PEB1102F, WUAFOSR2304A5.

CARNEGIE-MELLON UNIV PITTSBURGH PA DEPT OF MATERIALS
SCIENCE AND ENGINEERING

(U) Generic Consequences of Fundamental Studies of Beta Phase Decomposition Modes in Titanium and Related Alloy Systems.

DESCRIPTIVE NOTE: Final rept. 30 Sep 89-31 Mar 92.

MAR 92 50P

PERSONAL AUTHORS: Aaronson, H. I.; Mou, Y.; Hall, M. G.

CONTRACT NO. AFOSR-89-0550

PROJECT NO. 2305

TASK NO. A1

MONITOR: AFOSR, XF
TR-92-0386, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Throughout this final grant from AFOSR, the P.I. spent much of his time in the preparation of generic overviews of numerous major topics in diffusional phase transformations. These overviews dealt with homogeneous nucleation, interphase boundary structures in Ti-base alloys, effects of interphase boundary structure upon growth kinetics, shear vs. diffusional transformation mechanism (with emphasis upon linking macroscopic observations with processes proceeding at the atomic level), the mechanism (and definitions) of the bainite reaction and the influence of alloying elements upon the growth kinetics of grain boundary allotriomorphs of proeutectoid ferrite. A major overview of the ledge mechanism in vapor-crystal, liquid-crystal and crystal-crystal diffusional phase transformations, and a still broader overview of atomic mechanisms of diffusional nucleation and growth are nearing completion. Collaborative research with Dr. M. G. Hall of the University of Birmingham, U.K., on topics concerned with distinction between diffusional and shear mechanisms of transformation from the standpoints of crystallography and surface relief effects, has also made progress.

DESCRIPTORS: (U) *BAINITE, *CRYSTALLOGRAPHY, *PHASE

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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TRANSFORMATIONS, *TITANIUM ALLOYS, *DECOMPOSITION, ALLOYS, BOUNDARIES, CRYSTALS, DETERMINATION, FERRITES, GRAIN BOUNDARIES, GRANTS, HEIGHT, KINETICS, LIQUID CRYSTALS, LIQUIDS, MODELS, NUCLEATION, PHASE, PREDICTIONS, PREPARATION, STRUCTURES, SURFACES, THESES, TIME, TRANSFORMATIONS, UNIVERSITIES, VAPORS, SILVER, DIFFUSION, SHEAR PROPERTIES, INTERFACES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2306A1, *Beta phase, Bollmann 0-Lattice theory, Interfacial ledges, Plate shaped.

CALIFORNIA UNIV BERKELEY DEPT OF MATERIALS SCIENCE AND MINERAL ENGINEERING

(U) Workshop on Low Temperature GaAs Buffer Layers.

DESCRIPTIVE NOTE: Final rept. 1 Mar 90-31 Mar 91.

MAR 92 11P

PERSONAL AUTHORS: Weber, Eicke

CONTRACT NO. AFOSR-90-0260

PROJECT NO. 2305

TASK NO. C1

MONITOR: AFOSR, XF
TR-92-0269, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) An invitational workshop was held in connection with the Spring 1990 Meeting in San Francisco. This was the first meeting on this emerging subject. Approximately 55 attendees were present and participated in the discussions. GaAs, Low Temperature, Buffer Layers.

DESCRIPTORS: (U) *LOW TEMPERATURE, *GALLIUM ARSENIDES, BUFFERS, TEMPERATURE, WORKSHOPS.

IDENTIFIERS: (U) WUAFOSR2305C1, *Buffer layers, Growth.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A250 785 20/11 20/13 14/2 12/1
 ARIZONA UNIV TUCSON ENGINEERING EXPERIMENT STATION
 (U) Instabilities of Damage and Surface Degradation
 Mechanisms in Brittle Material Structural Systems.

DESCRIPTIVE NOTE: Final rept. 1 Jul 89-31 Dec 91,

MAR 92 313P

PERSONAL AUTHORS: Tang, F. F.; Frantziskonis, G. N.;
 Desai, C. S.

CONTRACT NO. AFOSR-89-0460

MONITOR: AFOSR, XF
 TR-92-0386, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) A review of the theoretical and experimental information on surface degradation and related instabilities is presented, and the physical significance of surface or skin effects is identified. The research involves study of relation between surface degradation and scale or size as well as shape effects, and surface damage growth instabilities and related bursting in brittle materials. A theory is developed to trace growth of surface degradation and to identify onset of relevant instabilities. Here the internal length is also estimated based on available experimental results. A comprehensive series of laboratory compression tests are performed on rectangular specimens with different dimensions of an artificial rock like material. Simultaneous nondestructive ultrasonic measurements are obtained at various locations on the specimens. The damage and instability distributions obtained by using a finite element procedure and symbolic computation are related to the dissipated energy derived from ultrasonic measurements. Comparisons of theoretical predictions and nondestructive measurements correlate very well. Surface effects, Degradation, Energy dissipation, Brittle materials, Experiments, Numerical predictions, Verification.

DESCRIPTORS: (U) *MATERIALS, *DEFECTS(MATERIALS),
 *BRITTLENESS, *DAMAGE ASSESSMENT, *SURFACE PROPERTIES,
 *MECHANICAL PROPERTIES, COMPARISON, COMPRESSION,
 COMPUTATIONS, DAMAGE, DEGRADATION, DISSIPATION, ENERGY,

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INSTABILITY, LABORATORIES, MEASUREMENT, PREDICTIONS, ROCK,
 SHAPE, SURFACES, TEST AND EVALUATION, ULTRASONICS,
 CONCRETE, STRENGTH(MECHANICS), NONDESTRUCTIVE TESTING,
 STRESS ANALYSIS, FINITE ELEMENT ANALYSIS, ULTRASONIC
 TESTS, MICROSTRUCTURE, THERMODYNAMICS, STABILITY,
 BIFURCATION(MATHEMATICS), STRAIN GAGES, CRACK PROPAGATION.

IDENTIFIERS: (U) Compressive strength, Micromechanics.

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DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T85005

AD-A250 775 15/1 5/2

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NATIONAL RESEARCH COUNCIL WASHINGTON DC RESIDENT
RESEARCH ASSOCIATESHIP PROGRAM M

JOINT INST FOR LAB ASTROPHYSICS BOULDER CO

(U) National Academy of Sciences - National Research
Council Resident Research Associateship Program (RRA).(U) Applications of the Photorefractive Effect and Damage
Induced Effects in Fibers.

DESCRIPTIVE NOTE: Final rept. 1 Jan-31 Dec 91,

DESCRIPTIVE NOTE: Annual rept. 1 Nov 90-31 Oct 91,

MAR 92 90P

MAR 92 17P

PERSONAL AUTHORS: Manka, R. H.

PERSONAL AUTHORS: Anderson, Dana Z.

CONTRACT NO. F49620-89-C-0053

CONTRACT NO. AFOSR-90-0198

PROJECT NO. 2308

PROJECT NO. 2301

TASK NO. D4

TASK NO. A1

MONITOR: AFOSR, XF
TR-92-0423, AFOSRMONITOR: AFOSR, XF
TR-92-0313, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The purpose of the Resident Research Associateship Program is to (1) provide postdoctoral scientists and engineers or usual promise and ability opportunities for research on problems largely of their own choice, which are compatible with research interests of the sponsoring Air Force Systems Command Laboratories, and (2) to contribute thereby to the overall research effort of the federal labs.

DESCRIPTORS: (U) *MILITARY RESEARCH, AIR FORCE, AIR FORCE SYSTEMS COMMAND, ENGINEERS, LABORATORIES, SCIENTISTS, SELECTION, REPORTS.

IDENTIFIERS: (U) WJAFOSR2308D4, PE61102F, Resident Research Associateship Program, Air Force Systems Command Laboratories..

ABSTRACT: (U) One aspect of this work concerns the processes of self-organized second-harmonic generation in fibers. We have experimentally investigated the nature of grating formation in the glass fibers and found it to be reversible. That is, a grating can be repetitively written, erased, and re-written. We have also shown that the grating erasure follows a power-law time dependence and explain the dependence as a consequence of the transverse mode structure of the fields in the fiber. Numerical work has focused on the microscopic aspect of ionization from a model defect potential. We have integrated Schrodinger's equation exactly in the one-dimensional case. Results so far indicate that a photovoltaic explanation of second-harmonic generation in fibers is robust against variation of the physical parameters of the model. The second aspect concerns the dynamics and self-organization of photorefractive optical circuits. We have produced circuits that self-organize according to the nature of their time dependent input. After self-organizing they process information in an adaptive and useful way. Our most highly developed circuit is a demultiplexer that separates signals from a multimode fiber. Nonlinear optics, photorefractive effects.

DESCRIPTORS: (U) *GLASS FIBERS, *NONLINEAR OPTICS.

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*GRATINGS(SPECTRA), DYNAMICS, EQUATIONS, ERASURE, INPUT, IONIZATION, MODELS, MULTIMODE, ONE DIMENSIONAL, OPTICAL CIRCUITS, OPTICS, ORGANIZATIONS, PARAMETERS, REVERSIBLE, SIGNALS, STRUCTURES, TIME DEPENDENCE, TRANSVERSE, SCHRÖDINGER EQUATION.

THIN FILM CONCEPTS INC ELMSFORD NY

(U) Novel Si-YBCuO Reactive Patterning Technique for Manufacture of Large Area High Tc Superconducting Electronic Devices.

IDENTIFIERS: (U) PES1102F, WUAFOSR2301A1.
*Photorefractive effects, Second harmonic generation, Demultiplexer.

DESCRIPTIVE NOTE: Final rept. 1 Sep 91-31 Mar 92.

APR 92 23P

CONTRACT NO. F49620-91-C-0069

PROJECT NO. 1601

TASK NO. 01

MONITOR: AFOSR, XF
TR-92-0295, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) A technique to pattern YBCuO utilizing rapid thermal annealing to intermix layers such as silicon with the superconductor was analyzed. Films were prepared using laser ablation, and e-beam deposition. Areas that intermixed destroyed the superconductivity and allowed 10 micron lines to be fabricated. The system was evaluated using SEM, Auger, XPS and x-ray diffraction. Another technique was investigated in which silicon films were deposited and patterned over existing YBCuO films. The silicon was patterned and then annealed to define micron-sized superconducting patterns. This technique is relevant to producing large-area superconducting patterns such as delay lines, microwave devices, and packaging interconnects.

DESCRIPTORS: (U) *ANNEALING, *SUPERCONDUCTIVITY, *THIN FILMS, AUGERS, DELAY, DELAY LINES, DEPOSITION, DIFFRACTION, FILMS, LASERS, LAYERS, MICROWAVES, PACKAGING, PATTERNS, SILICON, SUPERCONDUCTORS, X RAY DIFFRACTION, YTTRIUM COMPOUNDS, HIGH TEMPERATURE.

IDENTIFIERS: (U) WUAFOSR160101, *Yttrium boron copper oxide films, Thermal annealing.

AD-A250 767

AD-A250 740

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DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T85005

AD-A250 738

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AD-A250 732 20/3 9/1

NEW MEXICO UNIV ALBUQUERQUE DEPT OF ELECTRICAL
ENGINEERING AND COMPUTER SCIEN CE

WESTINGHOUSE SCIENCE AND TECHNOLOGY CENTER PITTSBURGH PA
(U) High Temperature Superconducting Films and Multilayers
for Electronics.

(U) Backward-Wave Oscillator Investigations in the Raman
Regime.

DESCRIPTIVE NOTE: Final rept.,

DESCRIPTIVE NOTE: Annual rept. 20 Feb 91-20 Feb 92.

FEB 92 71P

FEB 92 23P

PERSONAL AUTHORS: Schamiloglu, Edl; Gahl, John

PERSONAL AUTHORS: Gavalier, John R.; Talvacchio, John

CONTRACT NO. AFOSR-89-0393

REPORT NO. 92-9SL2-SUPER-R1

PROJECT NO. 2301

CONTRACT NO. F49620-91-C-0034

TASK NO. A8

PROJECT NO. 2305

TASK NO. GS

MONITOR: AFOSR, XF
TR-92-0286, AFOSR

MONITOR: AFOSR, XF
TR-92-0286, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The short-pulse backward-wave oscillator
(BWO) experiment utilizes a 600-700 KeV, 1-4 KA electron
beam to generate microwave radiation due to the
interaction with sinusoidally-rippled wall slow wave
structures.

ABSTRACT: (U) The four tasks of this three-year program
address properties fundamental to (1) enhancing the
superconducting properties of HTS films, (2) the
application of HTS films in passive microwave circuits,
(3) the realization of HTS digital electronics, and (4)
the development of new superconducting devices. Progress
during the first year included significant enhancements
in the properties of superconducting YBCO films. One of
these, the elimination of surface roughness due to Cu
particles, was essential for the subsequent growth of
high quality multilayer structures. For the first time,
uniform large-area YBCO films were sputtered on both
sides of a substrate with properties equal or superior to
those of single-sided smaller-area films. Two new device
configurations were developed: the integration of a
ferroelectric film on a YBCO electrode compatible with
ferroelectric memory cells and a step-edge S-N-S
Josephson junction using in-situ deposited gold as the
normal metal. SQUIDS fabricated with such junctions had
the highest yield of any HTS junction configuration.
Epitaxial superconducting Ba-K-Bi-O films were deposited
and the gap energy was measured as a function of
temperature in low-leakage S-I-N tunnel junctions.
Epitaxial YBCO/insulator/YBCO trilayers using Sr-Ti-O and

DESCRIPTORS: (U) *BACKWARD WAVE OSCILLATORS,
RADIOFREQUENCY PULSES, SLOW WAVE CIRCUITS, PLASMA DEVICES.

IDENTIFIERS: (U) WUAFOSR2301A8, PE62301E.

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DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T85005

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AD-A250 715 8/1 6/3 6/4

MICHIGAN UNIV ANN ARBOR DIV OF RESEARCH DEVELOPMENT AND ADMINISTRATION

La-A1.

DESCRIPTORS: (U) *ELECTRONICS, *SUPERCONDUCTORS, BARIUM, BARRIERS, COPPER, CRITICAL TEMPERATURE, ELECTRODES, ENERGY, GOLD, INTEGRATION, JOSEPHSON JUNCTIONS, JUNCTIONS, METALS, MICROWAVES, OXIDES, QUALITY, SPUTTERING, STRUCTURES, SUBSTRATES, SURFACE ROUGHNESS, THIN FILMS, TUNNELING, YIELD, YTTRIUM, FERROELECTRIC MATERIALS, INSULATION.

IDENTIFIERS: (U) WUAFOSR2305GS, PEG1102F, Yttrium barium copper oxide, *High temperature super conductors, Microwave circuits, Digital electronics, Superconducting devices, SQUID(Semiconducting Quantum Interference Device), Strontium titanium oxide, Lanthanum aluminum oxide, Barium potassium bismuth oxide.

PERSONAL AUTHORS: Goad, Linda S.

CONTRACT NO. AFOSR-88-0315

PROJECT NO. 2312

TASK NO. A4

MONITOR: AFOSR, XF
TR-92-0407, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) These studies demonstrate that lipid composition of both diatom cultures and natural phytoplankton assemblages varies greatly on a diel cycle. Exposure experiments on both cultures of diatoms and natural assemblages demonstrated that different results could be obtained by merely changing the timing of the initial exposure. Cells that were undergoing changes in lipid composition appeared to be most susceptible to chlorinated hydrocarbons, especially when periods of polar lipid synthesis immediately followed the exposure. However, as a rule, the chlorinated benzenes at concentrations approaching water solubility, did not appear to have significant long term effects on the diatom cultures studied. Short-term changes were observed, but recovery was also evident. The effect of timing of exposure suggests that standard toxicity tests should be conducted with extreme care since results may vary with the natural diel lipid cycle. Lipid composition, phytoplankton, *oxicans, diatoms, light-cycle.

DESCRIPTORS: (U) *LIPIOS, *PHYTOPLANKTON, CELLS, CHLORINATED HYDROCARBONS, CULTURE, HYDROCARBONS, LIGHT, RECOVERY, SOLUBILITY, SYNTHESIS, TOXICITY, WATER.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2312A4, *Diatoms.

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UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A250 715 CONTINUED

*Diel cycle.

AD-A250 712 6/1

MONTANA STATE UNIV BOZEMAN DEPT OF CHEMISTRY

(U) 2,6-Dichlorophenolindophenol is a Competitive Inhibitor for Xanthine Oxidase and Is Therefore Not Usable as an Electron Acceptor in the Fluorometric Assay.

92 5P

PERSONAL AUTHORS: Mest, Stephen J.; Kosted, Paul J.; Van Kuijk, Frederik J.

CONTRACT NO. AFOSR-90-0327

PROJECT NO. 2312

TASK NO. A5

MUNITOR: AFOSR, XF
TR-92-0298, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Free Radical Biology and Medicine, v12 p189-192 1992. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) Xanthine oxidase has been recognized as an important source of oxygen free radicals in ischemia-reperfusion injury. In order to study this enzyme in biological tissues, the conversion of pterin (2-amino-4-hydroxypteridine) to isoxanthopterin provides the basis for a very sensitive fluorometric assay. Xanthine oxidase is typically assayed in the presence of pterin only, while an electron acceptor which replaces NAD+ is used to determine the combined xanthine dehydrogenase plus xanthine oxidase activity. 2,6-Dichlorophenol-indophenol has been used as an electron acceptor in this assay. However, it was found in this study that it acts as an effective competitive inhibitor for xanthine oxidase. We concluded that methylene blue is the electron acceptor of choice in the fluorometric assays for xanthine oxidase.

DESCRIPTORS: (U) *INHIBITORS, *OXIDOREDUCTASES, CONVERSION, DEHYDROGENASES, ELECTRON ACCEPTORS, ELECTRONS, ENZYMES, FREE RADICALS, ISCHEMIA, METHYLENE BLUE, OXYGEN, PURINE ALKALOIDS, SELECTION, FLUOROMETERS, REPRINTS.

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DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T85005

AD-A250 712 CONTINUED

AD-A250 711 20/4

IDENTIFIERS: (U) *Dichlorophenolindophenol.
*Fluorometric assay, Ischemia reperfusion injuries,
pterin, Xanthine dehydrogenases.

ILLINOIS INST OF TECH CHICAGO FLUID DYNAMICS RESEARCH
CENTER

(U) Interactive Control in Turbulent Shear Layers.

DESCRIPTIVE NOTE: Annual rept. Feb 91-Jan 92.

FEB 92 35P

PERSONAL AUTHORS: Wark, Candace E.; Nagib, Hassan M.

CONTRACT NO. AFDSR-90-0171

PROJECT NO. 2307

TASK NO. BS

MONITOR: AFOSR, XF
TR-92-0374, AFOSR

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Original contains color plates. All
DTIC and NTIS reproductions will be in black and white.

ABSTRACT: (U) Using Particle Image Velocimetry in a
turbulent pipe flow, instantaneous large-scale structures
were observed, which are not seen in low Reynolds number
direct numerical simulations of bounded turbulent shear
flow. A probable explanation for this discrepancy is the
much larger experimental Reynolds number as compared with
the DNS results. Further support of this Reynolds number
influence was found when quantifying the relative role of
the outer-layer structures and wall-layer structures on
the spanwise correlation coefficient between the wall-
shear stress and streamwise velocity. That is, the
results suggest that the influence of the outer flow on
the streamwise velocity fluctuations at $y^+ = 10$
increases with increasing Reynolds number. This outer-
layer effect was then further examined in terms of the
boundary layer intermittency/wall-layer dynamics coupling.
Although the outer layer is directly influencing the wall-
layer region, it was found that the alternating passages
of laminar and turbulent regions in the intermittent part
of the boundary layer were not directly influencing the
buffer layer statistics. The mechanisms of this influence
are currently being investigated. Coherent Structures,
Turbulent Boundary Layers, Reynolds Number Scaling.

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AD-A250 712

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AD-A250 711 CONTINUED

AD-A250 710 17/4.3 20/14 9/1

HUGHES RESEARCH LABS MALIBU CA

DESCRIPTORS: (U) *TURBULENT BOUNDARY LAYER, BUFFERS, COEFFICIENTS, CORRELATION, COUPLINGS, DYNAMICS, LAYERS, NUMBERS, PARTICLES, PIPE FLOW, REYNOLDS NUMBER, SCALE, SIMULATION, STATISTICS, STRUCTURES, VELOCITY, WALLS, OPTICAL IMAGES, LASER VELOCIMETERS.

(U) Electromagnetic-Wave Propagation in Unmagnetized Plasmas.

DESCRIPTIVE NOTE: Final rept. 1 May 89-31 Jan 92.

MAR 92 65P

PERSONAL AUTHORS: Gregoire, D. J.; Santoru, J.; Schumacher, R. W.

REPORT NO. HAC-REF-G8200

CONTRACT NO. F49620-89-C-0063

PROJECT NO. 2301

TASK NO. AS

MONITOR: AFOSR, XF
TR-92-0294, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This final report describes an investigation of electromagnetic-wave propagation in unmagnetized plasmas and its application to the reduction of the radar cross section (RCS) of a plasma-filled enclosure. We have demonstrated RCS reduction of 20 to 25 dB with a prototype system at the radar range at Hughes Aircraft's Microwave Products Division in Torrance. The prototype consists of a sealed ceramic enclosure with a microwave reflector and a plasma generator inside it. When the plasma is present, the RCS is significantly reduced over a frequency range of 4 to 14 GHz. As part of the program, we also investigated the basic-plasma-physics issues relating to the absorption and refraction of electromagnetic (EM) waves in collisional plasmas. We demonstrated absorption as high as 63 dB in a section of plasma-loaded C-band rectangular waveguide. We also developed a theoretical model for the plasma cloaking process that includes scattering contributions from the plasma-vacuum interface, partial reflections from the plasma, and collisional absorption in the plasma. The theoretical model is found to be in reasonable agreement with the experimental results and can be used to confidently design future plasma cloaking systems. Plasma

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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AD-A250 706 7/5 20/6 7/2

JOHNS HOPKINS UNIV BALTIMORE MD DEPT OF CHEMISTRY

Cloaking, RCS Reduction.

DESCRIPTORS: (U) *ELECTROMAGNETIC WAVE PROPAGATION, *RADAR COUNTERMEASURES, *PLASMAS(PHYSICS), *STEALTH TECHNOLOGY, ABSORPTION, C BAND, INTERFACES, MICROWAVES, MODELS, PLASMA GENERATORS, PROTOTYPES, RADAR, REDUCTION, REFLECTION, REFLECTORS, REFRACTION, SCATTERING, VACUUM, WAVE PROPAGATION, WAVEGUIDES, RADAR ABSORBING MATERIALS, CERAMIC MATERIALS.

(U) Study of the Pressure Dependence of the N283Pig-A3Epsilon(u)+ Chemiluminescence from the N + N3 Reaction.

92 6P

PERSONAL AUTHORS: Quinones, Edwin; Dagdigian, Paul J.

CONTRACT NO. F49620-88-C-0056

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR, XF
TR-92-0376, AFOSR

UNCLASSIFIED REPORT

IDENTIFIERS: (U) PE61102F, WUAFOSR2301AS.

Availability: Pub. in Jnl. of Physical Chemistry, v96 n5 p2201-2205 1992. Available only to DTIC users. No copies furnished by NTIS.

Reprint: Study of the Pressure Dependence of the N283Pig-A3Epsilon(u)+ Chemiluminescence from the N + N3 Reaction.

DESCRIPTORS: (U) *NITRIDES, *AZIDES, *NITROGEN COMPOUNDS, *CHEMILUMINESCENCE, DISSOCIATION, CHEMICAL REACTIONS, REPRINTS, PRESSURE, ARGON, STEADY STATE, ELECTRONIC STATES, EMITTANCE, ATOMS.

IDENTIFIERS: (U) Discharge flow experiments, PE61102F, WUAFOSR2303B1.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A250 705 6/4 20/6

AD-A250 705 CONTINUED

HARVARD UNIV CAMBRIDGE MA DIV OF APPLIED SCIENCES

CONSTANTS, CONTRAST, COORDINATES, DIAMETERS, FLASHES,
GAIN, MEASUREMENT, RESPONSE, STIMULI, TUNING.

(U) The Effects of Luminance Boundaries on Color
Perception.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A5.

DESCRIPTIVE NOTE: Annual rept. 15 Mar 91-14 Mar 92.

APR 92 12P

PERSONAL AUTHORS: Kronauer, R. E.; Stromeyer, C. F., III;
Chaparro, A.; Eskew, R. T., Jr

CONTRACT NO. AFOSR-89-0304

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR, XF
TR-92-0375, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Extensive measurements were made for detecting luminance and red-green flashes in the center of a bright yellow field. Thresholds, plotted in L and M-cone contrast coordinates, indicate that chromatic flashes are more visible than luminance flashes even at very small size (2' diameter). Over a wide range of flash diameters and durations the chromatic flashes are detected with considerably higher efficiency (in units of cone contrast energy) than the most detectable luminance stimuli (small drifting gratings). The higher gain of the chromatic mechanisms has important physiological implications and is potentially useful in display technology. Detailed studies with luminance and chromatic stimuli suggest that the chromatic mechanisms have a constant spectral tuning, even for spots as small as 2'; the chromatic response is determined by a constant, equally weighted difference of L and M cone contrast. A suprathreshold luminance flash (a pedestal) facilitates detection of a coincident chromatic flash. Earlier studies suggested that the facilitation will grow strongly when the stimuli were decreased in size. In contrast, we find that facilitation is constant (2-3x) for stimuli from 2' to 2 deg diameter.

DESCRIPTORS: (U) *DETECTION, *LUMINANCE, *COLOR VISION,

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A250 700 CONTINUED

AD-A250 700 20/4 9/2

CALIFORNIA UNIV LOS ANGELES SCHOOL OF ENGINEERING AND APPLIED SCIENCE

(U) Adaptive and Nonadaptive Feedback Control of Global Instabilities with Application to a Heated 2-D Jet.

DIMENSIONAL FLOW, *OSCILLATION, *WAKE, *FLUID CONTROL, ACOUSTICS, ACTUATORS, BOUNDARIES, HOT WIRE ANEMOMETERS, CYCLES, DIFFERENTIAL EQUATIONS, FEEDBACK, FLUIDS, GLOBAL, INPUT, LIMITATIONS, METHODOLOGY, MODELS, NUMBERS, OUTPUT, REYNOLDS NUMBER, STABILITY.

DESCRIPTIVE NOTE: Final technical rept. 15 Jun 89-31 Dec 91.

IDENTIFIERS: (U) Feedback control, Self-excited fluid oscillations, Heated jets, Bluff-body wakes, PE61102F, WUAFOSR23078S, Ginzburg Landau equations.

APR 92 63P

PERSONAL AUTHORS: Monkewitz, Peter A.; Mingori, D.L.

REPORT NO. UCLA-ENG-92-28

CONTRACT NO. AFOSR-89-0421

PROJECT NO. 2307

TASK NO. BS

MONITOR: AFOSR, XF
TR-92-0427, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Close to the onset of self-excited fluid oscillations the generic complex Ginzburg-Landau is proposed as the lowest order model for the plant. Its linear part which provides the stability boundaries is derived from first principles for both doubly-infinite and semi-infinite flow domains. Concentrating on a single global mode, the model is further simplified to the Stuart-Landau equation. For this latter model a methodology is developed for the design of single-input single-output controllers. The so designed controllers have been implemented on a self-excited, heated two-dimensional jet with one hot wire as sensor and an acoustic speaker as actuator, and are shown to be effective within their limitations in suppressing or enhancing limit-cycle oscillations. Finally, the effect of a controller designed to suppress the most unstable global mode on other modes is investigated experimentally in the wake of a cylinder at low Reynolds number, where an encouraging semi-quantitative correspondence to the Ginzburg-Landau model is found.

DESCRIPTORS: (U) *BLUNT BODIES, *JET FLOW, *TWO

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OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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AD-A250 664 CONTINUED

ECOLE POLYTECHNIQUE PALAISEAU (FRANCE) LAB DE PHYSIQUE
DES MILIEUX IONISES

ELECTRONS, IMPACT, ION DENSITY, ION SOURCES, IONS, LASERS,
NEUTRAL, POWER, PRESSURE, PRODUCTION, QUALITY, RATIOS,
SIMULATION, SURFACES, TEMPERATURE, TURBULENCE, VOLUME, N
BODY PROBLEM, ION BEAMS, PLASMAS(PHYSICS).

(U) Diagnostics and Modeling of H (-) Ion Sources.

DESCRIPTIVE NOTE: Final rept. 1 Sep 89-31 Dec 91.

IDENTIFIERS: (U) *Negative ion temperature, *Laser
photodetachment, Electron temperature, Molecular
collisions.

FEB 92 37P

PERSONAL AUTHORS: Bacal, Marthe

CONTRACT NO. AFOSR-89-0538

PROJECT NO. 2301

TASK NO. A7

MONITOR: AFOSR, XF
TR-92-0273, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The negative ion temperature has been measured in hydrogen and deuterium, using the laser photodetachment technique. The negative ion temperature is strongly dependent on the neutral gas pressure, the discharge current and the electron temperature. It was inferred that many-body processes (fields, turbulence or collisions in fields) cause an increase in the negative ion temperature and adversely affect extracted beam quality. The deuterium negative ion temperature is significantly lower, compared to that found in hydrogen. The modeling of surface effects has been initiated by varying the surface/volume ratio in a pure volume negative ion source. It was found that the increase of this ratio was only effective for enhancing the negative ion density when the power density was high enough, so that the volume destruction processes should control the production of vibrationally excited molecules. The modeling of a volume source with some amount of surface negative ion production due to positive ion and atom impact has shown that increasing the surface/volume ratio leads to a significant increase in negative ion density. Negative Ion Temperature, Negative Ion Production, Laser Diagnostics, Plasma, simulation.

DESCRIPTORS: (U) *HYDROGEN, *PLASMA DIAGNOSTICS, ATOMS,
COLLISIONS, CONTROL, DENSITY, DESTRUCTION, DEUTERIUM,

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A250 657 20/3 9/3

AD-A250 657 CONTINUED

XEROX PALO ALTO RESEARCH CENTER CA

(U) Pulsed Laser Deposition of High Tc Superconducting Thin Films.

QUALITY, RATES, SAPPHIRE, SEMICONDUCTORS, SENSITIVITY, SILICON, STRUCTURES, SUBSTRATES, SUPERCONDUCTIVITY, THIN FILMS, TUNNELS, VELOCITY, YIELD, GALLIUM ARSENIDES, JOSEPHSON JUNCTIONS, TUNNELING(ELECTRONICS), INFRARED DETECTION.

DESCRIPTIVE NOTE: Final rept.,

IDENTIFIERS: (U) WUAFSR2306C1, PEG1102F, Laser deposition, Yttrium barium copper oxide, Applications, Praseodymium oxide, Flux pinning, *High temperature superconductors.

APR 92 159P

PERSONAL AUTHORS: Boyce, J. B.; Connell, G. A.

CONTRACT NO. F49820-90-C-0089

PROJECT NO. 2306

TASK NO. C1

MONITOR: AFOSR, XF
TR-92-0345, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Superconducting thin films have been deposited in-situ on several substrate materials using pulsed excimer laser deposition. The major accomplishments were in four separate areas: (1) We were the first to grow excellent quality YBa2Cu3O7 on Si and on silicon-on-sapphire. The quality of these films has enabled several applications and other studies to be realized. These include infrared detectors and superconducting metal-insulator-semiconductor structures, as well as flux motion studies. (2) We were the first to grow excellent quality YBCO on GaAs. This success allows superconductors to be combined with high-speed GaAs for future device applications. (3) We were the first to grow a-axis oriented YBCO films using monolayer buffers of pro2. This structural orientation favors technical applications, such as, Josephson devices or tunnel junctions. (4) We were the first to observe an extreme sensitivity of T sub c to cool-down rate for epitaxial Fe-doped YBCO films. These results not only may yield information on the role of the Cu-O chains and planes in the superconductivity of this material but also may lead to procedures to increase the flux pinning.

DESCRIPTORS: (U) *DEPOSITION, *SUPERCONDUCTORS, *PULSED LASERS, BUFFERS, CHAINS, DETECTORS, EXCIMERS, FILMS, INFRARED DETECTORS, LASERS, MATERIALS, METALS, MOTION,

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A250 643

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CONTINUED

COLORADO STATE UNIV FORT COLLINS DEPT OF ATMOSPHERIC
SCIENCE

DESCRIPTORS: (U) *CLOUDS, *RADIATIVE TRANSFER, *WEATHER
FORECASTING, *LIGHT SCATTERING, *CLOUD PHYSICS, AIRCRAFT,
ALGORITHMS, DIFFRACTION, ELIMINATION, ICE, INTERFACES,
MAPS, MISSIONS, REDUCTION, SCIENTISTS, STREAMS, WATER.

(U) Clouds - Their Prediction and Simulation.

DESCRIPTIVE NOTE: Annual rept. 1 Jun 91-31 Dec 91.

IDENTIFIERS: (U) WUAFDSR2310CS, PE61102F, Ice clouds.

DEC 91

4P

PERSONAL AUTHORS: Cotton, William R.

CONTRACT NO. AFDSR-91-0269

PROJECT NO. 2310

TASK NO. CS

MONITOR: AFOSR, XF
TR-92-0280, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Piotr Flatau has nearly completed a new comprehensive two-stream radiative transfer (RT) code which includes cloud water and ice scattering properties. The code is interfaced to the RAMS bulk cloud microphysics module. Several algorithmic improvements have been made to all three major components of the RT package: molecular gases, single scattering properties of clouds, and radiative transfer solver. Reduction and elimination algorithms for the RT solver have been developed. The code has been efficiently written to take advantage of vectorization and parallelization issues. New interfaces to LOWTRAN7 and MODTRAN are also provided. Single scattering properties are included using the anomalous diffraction theory (ADT). A number of members of our research group participated in the FIRE IT Cirrus field experiment in Coffeyville, Kansas (November 12-December 12). This was an extremely successful mission. RAMS was used in a forecasting mode, and data were gathered for future cases studies including data specially tailored for mesoscale modeling during the Intensive Observing Period. We gathered MAPS and NGM data for all the days of the project, collected satellite pictures, and relevant meteorological information. Piotr Flatau and Graeme Stephens also served as mission planning scientists for the NCAR Saberliner aircraft.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A250 642 CONTINUED

WISCONSIN UNIV-MADISON DEPT OF ENGINEERING MECHANICS

(U) New Transient and Pseudo-Transient Algorithms for
Viscoelastic Materials.

IDENTIFIERS: (U) WUAFOSR2304A3, PE61102F, *Planar
viscoelastic fluids, Thermographic stress analysis.

DESCRIPTIVE NOTE: Final technical rept. 15 Dec 88-14 Jun
91.

MAR 92 8P

PERSONAL AUTHORS: Malkus, David S.

CONTRACT NO. AFOSR-89-0220

PROJECT NO. 2304

TASK NO. A3

MONITOR: AFOSR, XF
TR-92-0271, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The principal investigator, D. S. Malkus, his post-doctoral associate, and Ph.D. students worked on three projects related to AFOSR research: (1) Planar viscoelastic flows of fluids with integral constitutive equations. The purpose of the project was to develop new algorithms for flows of non-Newtonian fluids and use them to study polymer-processing flows. (2) Simulation and analysis of differential infrared thermographic stress analysis--SPATE. A consistent thermodynamic theory of viscoplasticity was developed and methods for the experimental determination of model parameters were proposed. The consequence of viscoplastic behavior on differential thermography was studied, by simulating the SPATE stress analysis system. (3) Optimal mass in the finite element method. The purpose of the project was to explore the feasibility and usefulness of quadrature-based optimal mass matrix lumping techniques for higher-order finite element schemes, where they often produce indefinite but diagonal mass matrices.

DESCRIPTORS: (U) *ALGORITHMS, *FLUIDS, *VISCOPLASTICITY, BEHAVIOR, DETERMINATION, EQUATIONS, INTEGRALS, MASS, MODELS, PARAMETERS, POLYMERS, PROCESSING, SIMULATION, STRESS ANALYSIS, STUDENTS, THEORY, THERMODYNAMICS, THERMOGRAPHY.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A250 641 12/1 7/3

CALIFORNIA UNIV LOS ANGELES DEPT OF MATHEMATICS

(U) Algorithm to Solve Nonlinear Time Dependent Problems of Engineering and Physics.

DESCRIPTIVE NOTE: Final rept. 1 May 89-31 Oct 91.

OCT 91 2P

PERSONAL AUTHORS: Osher, Stanley

CONTRACT NO. AFOSR-89-0341

PROJECT NO. 6776

TASK NO. 00

MONITOR: AFOSR, XF
TR-92-0425, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) A triangle based nonoscillatory shock capturing algorithm was developed and applied successfully to immiscible oil recovery problems. Chevron researchers are now using this successfully for real problems.

DESCRIPTORS: (U) *ALGORITHMS, *RECOVERY, *PROBLEM SOLVING, *TIME DEPENDENCE, OILS, SHOCK, TRIANGLES, APPLIED MATHEMATICS, OIL WASTES.

IDENTIFIERS: (U) WUAFOSR230100, PE62301E.

AD-A250 640 6/1

TEXAS A AND M UNIV COLLEGE STATION DEPT OF BIOLOGY

(U) Melatonin, The Pineal Gland and Circadian Rhythms.

DESCRIPTIVE NOTE: Annual rept. 1 Mar 91-30 Apr 92.

APR 92 4P

PERSONAL AUTHORS: Cassone, Vincent M.

CONTRACT NO. AFOSR-90-0244

PROJECT NO. 2312

TASK NO. A3

MONITOR: AFOSR, XF
TR-92-0413, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This research tests the null hypothesis that the restricted phase of melatonin sensitivity in rats is at least partially due to a coincidence of the time at which exogenous melatonin is administered and the time at which endogenous melatonin begins to rise. Results suggest that the cerebral moiety responding to melatonin (presumably the SCN) responds to it quantally within a very restricted phase, and that this effect is independent of the pineal gland. Pinealectomy had no effect on the binding pattern, affinity or capacity within either the SCN or the pars tuberalis.

DESCRIPTORS: (U) *PINEAL GLAND, *SENSITIVITY, *HORMONES, GLANDS, PATTERNS, PHASE, RATS, TEST AND EVALUATION, TIME, CIRCADIAN RHYTHMS, PHASE STUDIES.

IDENTIFIERS: (U) *Melatonin sensitivity.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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NEW YORK UNIV NY COURANT INST OF MATHEMATICAL SCIENCES

RATES, SIMULATION, SYMMETRY, THREE DIMENSIONAL,
TURBULENCE, SOLAR CORONA, ENERGY TRANSFER.

(U) Solar Flare MDH.

IDENTIFIERS: (U) WUAFOSR2311AS, WUAFOSR2304CS, PE61102F,
Magnetic flux tubes, Alfven waves, Kelvin Helmholtz
instability, Plasma ballooning.

DESCRIPTIVE NOTE: Annual rept. 1 Jan-31 Dec 91,

DEC 91

7P

PERSONAL AUTHORS: Strauss, Henry R.

CONTRACT NO. AFOSR-91-0044

PROJECT NO. 2304, 2311

TASK NO. CS, AS

MONITOR: AFOSR, XF
TR-92-0288, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The following research problems were investigated in this program of theoretical solar plasma physics. (1). Three Dimensional Reconnection: A model with axially bounded magnetic flux tubes has been suggested as a source of coronal heating. Numerical simulations have supported this theory; (2). Fast Reconnection: A reconnection rate for the driven reconnection of solar coronal loops and other axially bounded magnetic fields has been obtained; (3). Approximate Equilibrium States: Equilibrium states appropriate for coronal flux tubes and for the magnetic tail of the magnetosphere have been constructed analytically and numerically; (4). Boundary Conditions: A full solution for plane symmetry has been obtained for standing plasma waves with a discontinuous anchoring conductivity; (5). Alfven Waves: It has been shown that highly energetic ions can resonantly destabilize Alfven waves but the effect of Kelvin Helmholtz turbulence prevents further Alfven wave growth, limiting them to a small fraction of the beam energy; (6). Ballooning Modes: The general ballooning equations have been developed. Very simple configurations have been found to be always unstable.

DESCRIPTORS: (U) *PLASMA WAVES, *SOLAR PHYSICS, BOUNDARIES, CONFIGURATIONS, EQUATIONS, HEATING, IONS, LOOPS, MAGNETIC FIELDS, MAGNETOHYDRODYNAMIC WAVES, MODELS.

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VANDERBILT UNIV NASHVILLE TN CENTER FOR ATOMIC AND MOLECULAR PHYSICS AT SURFA CES

(U) Surface Reactions in the Space Environment.

DESCRIPTIVE NOTE: Final rept. 1 Nov 89-30 Apr 91,

MAY 92 12P

PERSONAL AUTHORS: Albridge, Royal G.; Ewing, Carl S.; Haglund, Richard F., Jr.; Tellinghuisen, Joel B.; Tolk, Norman H.

CONTRACT NO. AFOSR-90-0030

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR, XF
TR-92-0424, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The object of this research program is to carry out experimental and theoretical studies of the detailed microscopic mechanisms by which electronic energy is absorbed, transported and dissipated in ionic solids. The ultimate aim of this program is identify and characterize essential constituent elements of comprehensive models which will quantitatively describe radiation-induced electronic phenomena. The theoretical and experimental aspects of the project has been carried out concurrently and interactively in order to realize the greatest scientific benefit from the collaboration. Throughout this project we have employed (1) experimental techniques already developed to monitor bulk and surface properties before, during, and after electron and photon irradiation and to characterize time and energy-dependent desorption phenomena, and (2) ab initio quantum-theoretical approaches to develop and refine computational models for determining properties of excited electronic states of relevant localized species. This research program bears directly on a broad spectrum of questions germane to the long-term operation of platforms in space, including structural, optical and electronic degradation of materials in the ambient near-

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earth environment, survivability under and hardening against irradiation from directed-energy weapons, vulnerability in disturbed nuclear atmospheres, and discrimination and sensing techniques based on radiation (glow) signatures.

DESCRIPTORS: (U) *DESORPTION, *ELECTRONIC STATES, *ENERGY, *IRRADIATION, *PHOTONS, *RADIATION, *SURFACE PROPERTIES, *SURVIVABILITY, *SPACE ENVIRONMENTS, APPROACH, ATMOSPHERES, BENEFITS, DEGRADATION, DIRECTED ENERGY WEAPONS, DISCRIMINATION, ELECTRONICS, ELECTRONS, ENVIRONMENTS, HARDENING, MATERIALS, MODELS, MONITORS, OPERATION, PLATFORMS, SIGNATURES, SOLIDS, SURFACES, VULNERABILITY, WEAPONS, DETECTION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303P2, Ionic solids, Excited electronic states, Ab Initio quantum, Theoretical approaches, Computational models, Disturbed nuclear atmospheres, Sensing techniques, Radiation(Glow) signatures.

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VIRGINIA UNIV CHARLOTTESVILLE DEPT OF ASTRONOMY

CORNELL UNIV ITHACA NY

(U) The 12 um Contribution of Nearby Galaxies to the Infrared Background.

(U) Propagating Surfaces in Isotropic Turbulence.

DESCRIPTIVE NOTE: Annual rept. 1 Aug 90-30 Sep 91,

92 31P

SEP 91 3P

PERSONAL AUTHORS: Thuan, Trinh X.

PERSONAL AUTHORS: Girmaji, S. S.; Pope, S. B.

CONTRACT NO. AFOSR-89-0467

CONTRACT NO. AFOSR-88-0052

PROJECT NO. 2311

PROJECT NO. 2308

TASK NO. BS

TASK NO. BS

MONITOR: AFOSR, XF
TR-92-0422, AFOSRMONITOR: AFOSR, XF
TR-92-0421, AFOSR

UNCLASSIFIED REPORT

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ABSTRACT: (U) The forty ultraluminous galaxies in the IRAS Bright Galaxy Sample of sources were mapped with 0.25 second resolution at 8.44 Grigahertz. Twenty five contain diffuse radio sources. These are almost certainly starburst galaxies. The IRAS flux densities for all galaxies detected in the Faint Source Survey have been obtained. The data contains a total of 1544 galaxies. The detection rate in the FSS improves substantially by a factor of three or more for the short wavelength bands at 12 and 25 microns. This sample will form the basis for studies of the far infrared properties of optically selected galaxies.

DESCRIPTORS: (U) *GALAXIES, *ASTRONOMY, *INFRARED STARS, DETECTION, RATES, RESOLUTION, SURVEYS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2311BS, Infrared astronomy, IRAS(Infrared Astronomical Satellite).

Availability: Pub. in Jnl. of Fluid Mech., v234 p247-277, 1992. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) Propagating surface evolution in isotropic turbulence is studied using velocity fields generated by direct numerical simulations. The statistics of tangential strain rate, fluid velocity, characteristic curvature and area-following propagating surface elements are investigated. The one-time statistics of strain rate and fluid velocity pan monotonically from Lagrangian value at low propagation speeds to Eulerian values at high speeds. The strain-rate statistics start deviating significantly from the Lagrangian values only for propagating velocities greater than the Kolmogorov velocity scale v_η , whereas, with fluid-velocity statistics the deviation occurs only for velocities greater than the turbulence intensity u' . The average strain rate experienced by a propagating surface decreases from a positive value to near zero with increasing propagation velocity. The autocorrelation function and frequency spectrum of fluid velocity and strain rate scale as expected in the limits of small and large propagation velocities. Turbulent Flamelets Computation Modeling Simulation

DESCRIPTORS: (U) *TURBULENCE, *DIGITAL SIMULATION, *FLAMES, AUTOCORRELATION, COMPUTATIONS, CURVATURE, FLUIDS, INTENSITY PROPAGATION, RATES, SCALE, SIMULATION,

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STATISTICS, STRAIN RATE, SURFACES, VALUE, VELOCITY,
REPRINTS.

TRW SPACE AND DEFENSE SECTOR REDONDO BEACH CA

IDENTIFIERS: (U) PEG1102F, WIAFOSR2308BS, Lagrangian
functions, Eulerian functions, Kolmogorov velocity.

(U) Laser-Initiated Conical Detonation Wave for Supersonic
Combustion.

APR 92 11P

PERSONAL AUTHORS: Carrier, G.; Fendell, F.; McGregor, R.;
Cool, S.; Vazirani, M.

CONTRACT NO. F49620-87-C-0081

PROJECT NO. 2308

TASK NO. 8S

MONITOR: AFOSR, XF
TR-92-0419, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Propulsion and Power, v8 n2
p472-480 Mar-Apr 92. Available only to DTIC users. No
copies furnished by NTIS.

ABSTRACT: (U) Preliminary theoretical studies are
undertaken of the feasibility of an air-breathing
supersonic combustor based on a stabilized, conically
configured, oblique detonation wave. The conical wave is
the result of the interaction of a train of spherical
detonation waves, each directly initiated by a very
rapidly repeatedly pulsed laser, which is tightly focused
on a fixed site (taken to be the origin of coordinates)
in a steady, uniform, supersonic stream of combustible
gaseous mixture. Downwind of the Chapman-Jouguet
detonation is a supersonic, isentropic, inviscid flow.
This expansional flow is self-similar and describable
entirely in terms of the spherical polar angle θ (where
 $\theta = 0$ is the axis of symmetry downwind of the
nonintrusive energy-deposition site, and $\theta = \theta_{\max}$
($\theta_{\max} > \theta_{\max} > 0$, identifies the locus of the conical
detonation wave). The combustor is idealized as a
circular-cross-section pipe upwind of the axial position
where the conical detonation wave interacts with the wall.
Downwind of this axial position, the reacted-gas flow is
no longer self-similar, and we seek to identify a not-
impractically-long, small-drag-incurring, axisymmetric
nozzle configuration such that the method-of-

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characteristics-computed pressure field at the plane is nearly uniform at the ambient-atmosphere value.
Detonation Wave Engine, Oblique Detonation Waves, Supersonic Combustion.

TRW SPACE AND DEFENSE SECTOR REDONDO BEACH CA

(U) Flame Configuration Associated with Localized Energy Addition to a Flowing Combustible Mixture.

DESCRIPTORS: (U) *DETONATION WAVES, *PULSED LASERS, *SUPERSONIC COMBUSTION, ANGLES, ATMOSPHERES, AXISYMMETRIC, CIRCULAR, COMBUSTORS, CONFIGURATIONS, CROSS SECTIONS, DRAG, ENGINES, GAS FLOW, INVISCID FLOW, LOCUS, METHOD OF CHARACTERISTICS, NOZZLES, PIPES, PRESSURE, RESPIRATION, SITES, STREAMS, SYMMETRY, UNIFORMS, VALUE, WALLS, REPRINTS, AIR BREATHING ENGINES.

APR 92 10P

PERSONAL AUTHORS: Fendell, F.; Kung, E.; Sheffield, M.

CONTRACT NO. F49620-87-C-0081

PROJECT NO. 2308

IDENTIFIERS: (U) PE61102F, WUAFQSR2308BS, Detonation wave engines, Expansional flow, Gaseous mixture, Conical wave, Oblique detonation waves.

TASK NO. BS

MONITOR: AFQSR, XF
TR-92-0418, AFQSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Propulsion and Power, v8 n2 p464-471 Mar-Apr 92. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) An approximate theoretical analysis is used to consider the configuration of a laminar axisymmetric flame in a combustible gaseous mixture, subject to large-activation-energy kinetics and flowing at a velocity in excess of the normal flame velocity (i.e., flowing supercritically). Attention is centered on nonintrusive energy addition from a line or point source by use of a laser. For continuous-ignition point source, the flame appears as a semi-finite bluff body. With its nose directed upwind. Away from the axis of symmetry, the flame approaches the conical shape that is observed when an adiabatic flame is stabilized in supercritical flows by different types of localized intrusive flameholders. In general, the temperature varies along the flame locus; the temperature is a maximum at the point of the locus that is on the axis of symmetry, and the temperature approaches the adiabatic flame temperature at large lateral distance from the axis. The corresponding planar-symmetric flame locus that arises from a line source in a supercritically flowing mixture is also analyzed. The solutions presented here are based on very simplified dynamics and hold only for negligible chemical exothermicity and negligible energy addition by the ignition source; they are intended only as starting

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points for needed further investigations. Flame Stabilization, Laser Ignition, Premixed flame.

CALIFORNIA INST OF TECH PASADENA GRADUATE AERONAUTICAL LABS

DESCRIPTORS: (U) *IGNITION, *FLAME PROPAGATION, ACTIVATION, ACTIVATION ENERGY, ADDITION, APPROACH, ATTENTION, AXISYMMETRIC, BODIES, CHEMICALS, CONFIGURATIONS, DYNAMICS, ENERGY, FLAMES, KINETICS, LASERS, LOCUS, MIXTURES, SHAPE, STABILIZATION, STARTING, SYMMETRY, TEMPERATURE, VELOCITY, REPRINTS.

(U) Unsteady and Separated Flows.

DESCRIPTIVE NOTE: Final rept. 1 Oct 86-10 Nov 91.

APR 92 189P

PERSONAL AUTHORS: Dimotakis, Paul E.; Leonard, Anthony; Roshko, Anatol

CONTRACT NO. F49620-86-C-0134

MONITOR: AFOSR, XF
TR-92-0400, AFOSR

IDENTIFIERS: (U) PEG1102F, WUAFOSR2308BS, *Flowing combustible mixture, Flame configuration, Localized energy, *Laminar axisymmetric flames, Gaseous mixture, Adiabatic flame, Flame stabilization, Premixed flame.

UNCLASSIFIED REPORT

ABSTRACT: (U) In these investigations, simple geometries were studied. Experiments and simulations examined the addition of unsteady motions, of flat plates inclined normal to the flow, and circular cylinders, to the conventional-steady motions of these bodies. The simulations also investigated the (three-dimensional) interactions of vortex rings and the startup flow of a square flat plate oriented normal to the direction of motion (bluff body configuration). Laboratory experiments and measurements on flow past flat plates nominally normal to the direction of motion were performed. The objectives of this research were to elucidate the dynamics of large vortical structure in globally steady and unsteady separated flows, and to develop techniques to modify their behavior and control them for desired effect. In-line accelerations and transverse oscillations of flat plates were evaluated to modify the flow structure. These investigations examined the behavior of the large vortical structures in the resulting unsteady and separated flow, and the associated forces on the flat plate. Vortex methods were used to study two- and three-dimensional flows. The objectives of this research were to develop methods to examine the large-scale separated vortices in the wake of bluff bodies, study the influence of transient motions of the body on these dynamics, and investigate control strategies to produce desired effects. Unsteady flow; separated flow; vortex interaction; flow control; numerical simulation; vortex methods.

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DESCRIPTORS: (U) *UNSTEADY FLOW, *VORTEX SHEDDING, *WAKE, *FLOW SEPARATION, *FLAT PLATE MODELS, CIRCULAR, CONTROL, DYNAMICS, FLOW, INTERACTIONS, MEASUREMENT, MOTION, OSCILLATION, RINGS, SCALE, SIMULATION, STRATEGY, TRANSIENTS, TRANSVERSE, VORTICES, THREE DIMENSIONAL FLOW.

IDENTIFIERS: (U) PE61102F.

CINCINNATI UNIV OH DEPT OF CHEMISTRY

(U) Surface Vibrational Spectroscopy. A Comparison of the EELS Spectra of Organic Adsorbates at Pt(111) with IR and Raman Spectra of the Unadsorbed Organics.

90 21P

PERSONAL AUTHORS: Kahn, Bruce E.; Chaffins, Scott A.; Gul, John Y.; Lu, Frank; Stern, Donald A.

CONTRACT NO. AFDSR-86-0200

PROJECT NO. 2303

TASK NO. A1

MONITOR: AFDSR, XF
TR-92-0383, AFDSR

UNCLASSIFIED REPORT

Availability: Pub. in Chemical Physics, v141 p21-39 1990.
Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) In this study EELS spectra was obtained for the adsorbed species formed from aqueous electrolytes at Pt(111) electrode surfaces are compared with the IR and Raman spectra of the unadsorbed compounds in order to reveal the changes in vibrational spectra resulting from chemisorption of various important functional groups, and to explore the differences in vibrational absorptivities between EELS spectra of adsorbed species and IR and Raman spectra of the corresponding unadsorbed compounds. Of particular interest are the variations in EELS vibrational frequency, bandwidth and absorptivity due to bonding with the surface, intermolecular interactions of adsorbed molecules and changes in adsorbate molecular orientation (PLD6), benzyl alcohol (BZOH), catechol (CT), benzoic acid (BA), 2-picolinic acid (PA), 2,5-pyridine dicarboxylic acid 9261 DCA), and propenoic acid (PPEA). The expected lack of perturbation was found, making TP, BM, and CYS particularly suitable reference compounds for surface vibrational studies of aromatic rings and amino acids. In contrast, L-phenylalanine (PHE) interacts with the Pt(111) surface through the phenyl rings as well as the amino acid functionality. In general, chemisorption and intra-layer intermolecular interaction both lower the

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surface vibrational frequencies (EELS) and incidentally affect peak amplitudes. Orientation affects peak amplitudes and incidentally affects frequencies insofar as a change in orientation is accompanied by a change in mode of surface bonding. Surface roughness leads to a scrambling of adsorbed states which affects bandwidths, chemical/electrochemical reactivities, and in turn the frequencies and amplitudes of EELS peaks. Specific findings and conclusions are presented for each compound and correlated.

DESCRIPTORS: (U) *VIBRATIONAL SPECTRA, *SURFACE CHEMISTRY, RAMAN SPECTRA, ELECTRODES, INFRARED SPECTRA, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A1, *Electrode surface, *EELS(Electron Energy Loss Spectroscopy), Absorbates, Platinum electrode.

AD-A250 582 12/3 12/4

OHIO STATE UNIV COLUMBUS DEPT OF STATISTICS

(U) Theory of System Reliability Demonstration. Burn-In Design, and Record Statistics.

DESCRIPTIVE NOTE: Final rept. 1 Jul 89-30 Jun 91.

APR 92 6P

PERSONAL AUTHORS: Blumenthal, Saul

CONTRACT NO. AFOSR-89-0357

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR, XF
TR-92-0359, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Estimations of component near-out time were improved by developing Poisson approximations to like distributions (shape-fit). The techniques were also successfully applied to burn-in distributions.

DESCRIPTORS: (U) *SYSTEMS ANALYSIS, *RELIABILITY, *STATISTICAL ANALYSIS, TIME, FAILURE, LIFE EXPECTANCY(SERVICE LIFE), WEAR, AGING(MATERIALS), APPROXIMATION(MATHEMATICS), POISSON RATIO, DISTRIBUTION FUNCTIONS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5, Burn in design.

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RUTGERS - THE STATE UNIV NEW BRUNSWICK NJ DEPT OF PHYSICS

WISCONSIN UNIV-MADISON WAISMAN CENTER ON MENTAL RETARDATION AND HUMAN DEVELOPM ENT

(U) Statistical Mechanics of Collective Phenomena in Plasmas.

(U) Additivity and Auditory Pattern Analysis.

DESCRIPTIVE NOTE: Final rept. 1 Nov 90-31 Oct 91.

DESCRIPTIVE NOTE: Final rept. 1 May 87-31 Mar 91.

OCT 91 7P

MAR 92 5P

PERSONAL AUTHORS: Lebowitz, Joel L.

PERSONAL AUTHORS: Lutfi, R.

CONTRACT NO. AFOSR-87-0010

CONTRACT NO. AFOSR-87-0240

PROJECT NO. 2301

PROJECT NO. 2313

TASK NO. ES

TASK NO. A6

MONITOR: AFOSR, XF

MONITOR: AFOSR, XF

TR-92-0277, AFOSR

TR-92-0303, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) We have carried out theoretical studies of equilibrium and nonequilibrium properties of strongly coupled particle systems, and of the phenomena which take place when neutral or partially ionized atoms interact strongly with external fields and with each other in a plasma. The main tools of our study are statistical mechanics and kinetic theory, including the transition from a microscopic to a hydrodynamic description. Quantum mechanics plays a central role in many of these problems, and is an important ingredient in our work.

DESCRIPTORS: (U) *HYDRODYNAMICS, ATOMS, EXTERNAL, KINETIC THEORY, KINETICS, MECHANICS, NEUTRAL, PARTICLES, STATISTICAL MECHANICS, THEORY, TOOLS, WORK.

IDENTIFIERS: (U) WUAFOSR2301ES.

ABSTRACT: (U) Human discrimination of complex acoustic signals typically cannot be predicted from the simple sum of the discriminabilities associated with individual components of the signal. Understanding such failures of additivity is central to our understanding of complex sound analysis. The goal of this project is to elucidate the rules and mechanisms whereby individual stimulus components combine to influence the detection and discrimination of complex sounds. The project is designed to answer specific questions regarding listeners' abilities to integrate information within and across acoustic dimensions, to extract information contained in the pattern of the acoustic signal, and to perform under conditions of stimulus uncertainty. The data are also used to determine how listeners weight the information provided by different components of the signal, and how best to package the acoustic information so as to be most effectively processed by the listener. Pattern Analysis, information, processing, stimulus uncertainty.

DESCRIPTORS: (U) *INFORMATION PROCESSING, ACOUSTIC SIGNALS, ACOUSTICS, DETECTION, DISCRIMINATION, FAILURE, HUMANS, PATTERNS, PROCESSING, SIGNALS, SOUND, UNCERTAINTY, WEIGHT.

IDENTIFIERS: (U) PES1102F, WUAFOSR2313A6, Pattern

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analysis, Acoustic information.

ROCHESTER UNIV NY CENTER FOR VISUAL SCIENCE

(U) Peripheral Limitations on Spatial Vision.

DESCRIPTIVE NOTE: Final rept. 1 Aug 88-31 Jan 92.

MAR 92 12P

PERSONAL AUTHORS: Williams, David R.

CONTRACT NO. AFOSR-88-0292

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR, XF
TR-92-0267, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This project employs psychophysical techniques to examine the limitations on spatial vision imposed by the first stages in the visual pathway. The appearance of very high frequency interference fringes is distorted, or aliased, by the cone mosaic. Such moire patterns allow us to assess the topography of the cone mosaic in the living eye, clarifying the relationship between cone spacing and resolution. Resolution was also measured under conditions in which only the M or L cones could detect the interference fringe. Visual acuity was little different than it was when both cone types detected the grating showing that resolution is immune to photoreceptor loss under these circumstances. We recently also established that a phenomenon known for 150 years has been misunderstood, and that it is chromatic aliasing caused by spatial sampling by M and L cones. A device has been constructed to provide objective measurements of the off-axis optical quality of the eye and measurements show that optical quality decline surprisingly little across the visual field. In addition, we have taken advantage of an early nonlinearity in the visual system to measure the spatial responses of the earliest stages in retinal processing. Human vision, spatial vision, color vision, resolution, acuity, cones, photoreceptor.

DESCRIPTORS: (U) *COLOR VISION, *HUMANS, *TOPOGRAPHY, *VISION, *VISUAL ACUITY, ACUITY, ADDITION, COLORS, EYE.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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FREQUENCY, HIGH FREQUENCY, INTERFERENCE, LIMITATIONS, MEASUREMENT, PATTERNS, PHOTORECEPTORS, PROCESSING, QUALITY, RESOLUTION, RESPONSE, SAMPLING, VERY HIGH FREQUENCY.

CALIFORNIA INST OF TECH PASADENA DIV OF BIOLOGY

(U) Controlling the Flow of Visual Information through the Lateral Geniculate Nucleus: From Single Cells to Neural Networks.

IDENTIFIERS: (U) PEB1102F, WUAFOSR2313A5.

DESCRIPTIVE NOTE: Final rept. 1 Nov 88-31 Oct 91,

OCT 91 8P

PERSONAL AUTHORS: Koch, Christof

CONTRACT NO. AFOSR-89-0029

PROJECT NO. 2313

TASK NO. A8

MONITOR: AFOSR, XF
TR-92-0309, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Over the last three years, we have carried out a number of projects under this grant, relating to the gating and processing of information in the mammalian visual pathway. Specifically, they have involved (1) a detailed computational investigation of the early visual system of the cat using both analytical as well as numerical tools, (2) a study of the dynamic properties of 2-D networks of coupled oscillatory neurons and (3) the outline of a first neurobiological theory of visual awareness.

DESCRIPTORS: (U) *NERVE CELLS, *VISION, AWARENESS, CATS, DYNAMICS, GRANTS, NETWORKS, NUMBERS, PROCESSING, THEORY, TOOLS, NEURAL NETS, MODELS, CELLS(BIOLOGICAL)

IDENTIFIERS: (U) PEB1102F, WUAFOSR2313, *Visual system, Lateral geniculate, *Visual pathways.

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UNIVERSITY OF NORTH TEXAS DENTON DEPT OF CHEMISTRY

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

(U) Structure of a Tetracyclic Diketone,

(U) Photoinduced Electron Transfer Quenching of Excited Ru(II) Polypyridyls Bound to DNA: The Role of the Nucleic Acid Double Helix,

90 4P

PERSONAL AUTHORS: Watson, William H.; Nagl, Ante; Marchand, Alan P.; Vidyasagar, V.

PERSONAL AUTHORS: Orellana, Guillermo; Kirsch-De Mesmaeker, Andree; Barton, Jacqueline K.; Turro, Nicholas J.

CONTRACT NO. AFOSR-88-0132

PROJECT NO. 2303

CONTRACT NO. AFOSR-91-0340

TASK NO. A3

PROJECT NO. 2303

MONITOR: AFOSR, XF
TR-92-0332, AFOSR

UNCLASSIFIED REPORT

MONITOR: AFOSR, XF
TR-92-0334, AFOSR

Availability: Pub. in Acta Crystallographica, Section C, VC46 p152-154 1990. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) The X-ray crystal structure of ethyl 3,12-dioxotetracyclo(6.4.0.02,6.05.9)dodec-10-ene-11-carboxylate is described. Compound (2) consists of a norbornane moiety with a five-membered ring and a six-membered ring fused along each side. The five-membered ring contains a ketone functionality and is in a half-chair conformation while the cyclohexenone ring exhibits a 1,2-diplanar conformation. The two end bonds of the norbornane moiety, 1.580 (5) and 1.569 (4) Å, are significantly longer than other bonds in the structure. The two ketone groups and attached atoms are each planar (0.004 Å r.m.s.d) and form an interplanar angle of 46.5 (4) deg. The ester side chain is disordered.

DESCRIPTORS: (U) *KETONES, *CYCLIC COMPOUNDS, *STRUCTURAL ANALYSIS, *ORGANIC COMPOUNDS, *CRYSTAL STRUCTURE, REPRINTS, X RAY SPECTRA.

IDENTIFIERS: (U) PEB1102F, WJAFOSR2303A3, *Tetracyclic diketones, Norbornane moiety, Half-chair conformation, *Cyclohexenones, Diplanar conformation.

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UNCLASSIFIED REPORT

Availability: Pub. in Photochemistry and Photobiology, v54 n4 p499-509 1991. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) In the presence of double helical polynucleotides the efficiency of oxidative or reductive electron transfer between photoexcited ruthenium(II) chelates Ru(tap) (hat) 2+ or Ru (phen) 2+ and appropriate cationic quenchers increases 1-2 orders of magnitude compared to the efficiency of the same quenching in microheterogeneous aqueous medium. The enhancement is more pronounced when the binding constant of the quencher is large. Similar trends are found when the biopolymers are replaced by sodium poly(styrenesulfonate) (PSS). The accelerated electron transfer process is proposed to be due mainly to the effect of accumulation of the reagents in the electrostatic field of the polymer; if corrections for this effect are introduced, the reaction rate becomes essentially independent of the polymer concentration. Based upon a model for electron transfer reaction of the complexes within a small cylindrical interface around the DNA helix, calculations of the bimolecular electron transfer rate constants are computed to be 10,000 times smaller when the reactants are bound to the double-stranded polynucleotides and decreased mobility of the

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cationic species is apparent. The effect is less pronounced if a simpler polyelectrolyte (PSS) is employed. Emission lifetimes of the Ru(II) polypyridyls bound to the DNA (0.32-2 us, double exponential decays) are discussed as well.

DESCRIPTORS: (U) *NUCLEIC ACID COMPONENTS, *ELECTRON TRANSFER, *PHOTOCHEMICAL REACTIONS, *POLYMERS, HELIXES, RUTHENIUM, DEOXYRIBONUCLEIC ACIDS, REPRINTS.

IDENTIFIERS: (U) Double helix, Biopolymers, Polypyridyls, PE61102F, WUAFOSR230382.

JOINT INST FOR LAB ASTROPHYSICS BOULDER CO

(U) Spin-Forbidden Decay of the Dication HS(2+).

JUN 91 5P

PERSONAL AUTHORS: Parlant, Gerard; Senekowitsch, Joerg; O'Neil, Stephen V.; Yarkony, David R.

CONTRACT NO. AFOSR-89-0074, \$AFOSR-90-0051

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR, XF
TR-92-0335, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Chemical Physics, v94 n11 p7208-7211 Jun 91. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) The lifetimes of the low-lying vibrational levels of the X2II state of the recently identified dication HS(2+) are considered. The stability of this state is attributable to a barrier formed from the avoided crossing of 2II states asymptotically characterized as H(+) + S(+) and H + S(2+). As a result of this barrier, the nonrelativistic X(2)II potential energy curve supports several quasisubband vibrational levels that are long lived with respect to tunneling. However, this is not the principal decay mechanism. We show that the lifetimes of the low-lying vibrational levels, v=0-4, are controlled entirely by the spin-orbit induced perturbation and the corresponding allowed crossing of the X(2)II potential energy curve by the dissociative potential energy curve which correlates with the ground state asymptote H(+) + S(+) (4S).

DESCRIPTORS: (U) *HYDROGEN SULFIDE, *CATIONS, *MOLECULAR IONS, *SPIN STATES, THEORY, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR230383, CAS(Complete Active Space) wave functions, CI(Configuration Interaction) wave functions, *Spin forbidden decay, *HS(2+), *Dications, Ab Initio, Spin-orbit perturbation.

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Calculations, Electronic structures.

PITTSBURGH UNIV PA SURFACE SCIENCE CENTER

(U) Minimizing Ultrahigh Vacuum Wall Reactions of Fe(CO)₅
by Chemical Pretreatment of the Dosing System.

OCT 91 4P

PERSONAL AUTHORS: Henderson, M. A.; Ramsier, R. D.; Yates,
J. T., Jr

CONTRACT NO. AFOSR-82-0133

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR, XF
TR-92-0325, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Vacuum Science and
Technology A, v9 n5 p2785-2787 Sep/Oct 91. Available only
to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) An effective method is described for
preventing the chemical decomposition of Fe(C)₅ on
stainless steel walls in an ultravacuum system. Metal
Carbonyls, Stainless Steel, Wall Effects, Gas Purity.

DESCRIPTORS: (U) *CHEMICALS, *DECOMPOSITION, *METAL
CARBONYLS, *STAINLESS STEEL, *IRON COMPOUNDS, *ULTRAHIGH
VACUUM, METALS, PURITY, STEEL, WALLS, REPRINTS,
ADSORPTION, SILVER, SURFACE PROPERTIES, MOLECULES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A2, *Iron
pentacarbonyl, *Wall reactions, *Pretreatment, *Dosing
system, Gas purity.

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FLORIDA UNIV GAINESVILLE QUANTUM THEORY PROJECT

VIRGINIA POLYTECHNIC INST AND STATE UNIV BLACKSBURG DEPT OF MATHEMATICS

(U) Performance of Single-Reference Coupled-Cluster Methods for Quasidegenerate Problems: The H4 Model,

(U) Modelling, Information Processing and Control.

91 15P

DESCRIPTIVE NOTE: Final rept. 1 Nov 88-31 Oct 91,

PERSONAL AUTHORS: Kucharski, S. A.; Balkova, A.; Bartlett, Rodney J.

OCT 91 37P

PERSONAL AUTHORS: Russell, David L.

CONTRACT NO. AFOSR-90-0079

CONTRACT NO. AFOSR-89-0031

PROJECT NO. 2301

PROJECT NO. 2304

TASK NO. DS

TASK NO. A1

MONITOR: AFOSR, XF

TR-92-0328, AFOSR

MONITOR: AFOSR, XF

TR-92-0270, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

Availability: Pub. in Theoretica Chimica Acta, v80 p321-334 1991. Available only to DTIC users. No copies furnished by NTIS.

Reprint: Performance of Single-Reference Coupled-Cluster Methods for Quasidegenerate Problems: The H4 Model.

ABSTRACT: (U) General Description of Program: The principal investigator, his associates and research assistants have carried out a program of research in the general area of distributed parameter systems modelling, identification and control. This work has been concentrated in four main areas. (1) Control of the Korteweg de Vries and other nonlinear partial differential equations exhibiting solitary waves. (2) Frequency domain analysis of distributed parameter systems. (3) Energy dissipation mechanisms in elastic structures. (4) Modelling and parameter estimation in elastic structures.

DESCRIPTORS: (U) *QUANTUM CHEMISTRY, HYDROGEN, CLUSTERING, REPRINTS.

IDENTIFIERS: (U) Coupled cluster theory, Quasidegeneration problem, PE61102F, WUAFOSR2301DS.

DESCRIPTORS: (U) *PARTIAL DIFFERENTIAL EQUATIONS, CONTROL, DIFFERENTIAL EQUATIONS, DISSIPATION, ENERGY, EQUATIONS, FREQUENCY, FREQUENCY DOMAIN, IDENTIFICATION, PARAMETERS, STRUCTURES, WORK.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A1.

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TEXAS UNIV AT AUSTIN DEPT OF ELECTRICAL AND COMPUTER
ENGINEERING

standing mystery about the origin of eddy current losses
in magnetic recording head laminates.

(U) Magnetic Properties of Nano-Heterogeneous Amorphous
Thin Films.

DESCRIPTORS: (U) *ALLOYS, BIAS, BROADBAND, COBALT,
DISPLACEMENT, EDDY CURRENTS, FILMS, FREQUENCY,
HEAD(ANATOMY), LAMINATES, LOSSES, MAGNETOS, MEASUREMENT,
METALS, MICROSTRUCTURE, MODELS, OPTICS, OXIDATION,
OXIDATION RESISTANCE, PERMEABILITY, PROCESSING,
RESISTANCE, REVERSIBLE, SPECTRA, SUBSTRATES, THIN FILMS,
TRANSITIONS, VALUE.

DESCRIPTIVE NOTE: Final rept. 1 Jun 88-31 May 91.

MAR 92 15P

PERSONAL AUTHORS: Walser, Rodger M.

IDENTIFIERS: (U) PEB1102F, WUAFOSR2306C1.

CONTRACT NO. F49620-87-C-0067

PROJECT NO. 2306

TASK NO. C1

MONITOR: AFOSR, XF

TR-92-0281, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) We report continued progress in understanding the nanostructuremagnetic property relationships in sputtered, amorphous, thin films. This research has been concentrated on two categories of sputtered magnetic thin films: (1) magnetically soft films, of cobalt-based, binary (cobalt-metalloid) alloys with in plane anisotropies, and (2) magnetically hard, binary (rare earth metal-transition metal) alloy films with perpendicular anisotropies. Major research results obtained include: (1) development of the first broadband measurement technique and apparatus for determining the complex permeability spectra of magnetic thin films in the 100KHz-200MHz frequency range; (2) processing of magnetically soft amorphous thin films with the highest values of RF permeabilities ever reported in the literature; (3) discovery of a new class of ultra-soft magnetic thin films with coercivities less than 0.1 Oe and completely reversible bias susceptibilities; (4) systematically studied the microstructure, magnetic and magneto-optic properties of Tb-Fe and Gd-Co compositionally modulated films; (4) demonstrated that substrate bias could be used to increase the oxidation resistance and improve the magnetic and magneto-optical properties of sputtered Tb-Fe CMFs; and (5) developed a model of displacement eddy currents to resolve a long

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PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF
MECHANICAL ENGINEERING

these studies isolate Richardson number as the only
variable parameter. Soot Formation, Soot Particles,
Diffusion Flames.

(U) Soot Particle Inception and Growth Processes in
Combustion.

DESCRIPTIVE NOTE: Final rept. 15 Jan 87-15 Jan 92.

A'R 92 132P

DESCRIPTORS: (U) *FUELS, *SOOT, ACTIVATION, ACTIVATION
ENERGY, COMPUTATIONS, DIAMETERS, DIFFUSION, ENERGY,
FLAMES, HIGH PRESSURE, MEAN, MOLECULAR STRUCTURE, NUMBERS,
PARAMETERS, PARTICLES, POWER, PRESSURE, RICHARDSON NUMBER,
SENSITIVITY, STRUCTURES, SURFACES, TEMPERATURE, VALUE,
VARIABLES, VARIATIONS, VOLUME.

PERSONAL AUTHORS: Santoro, Robert J.

CONTRACT NO. AFOSR-87-0145

IDENTIFIERS: (U) PE61102F, WUAFOSR2308BS, *Soot
formation, Fuel composition, *Growth processes.

PROJECT NO. 2308

TASK NO. BS

MONITOR: AFOSR, XF
TR-92-0396, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) A study of soot particle inception and growth has been completed which considered fuel molecular structure, fuel concentration, temperature and operating pressure effects. These studies indicated that fuel species most strongly affected the particle inception process, as opposed to the surface growth process, and support an interpretation that inception controls the maximum amount of soot formed. Studies of concentration and temperature variations indicated that temperature effects dominate. The analysis yielded an apparent activation energy of 94.5 kcal/mole for the temperature dependence, while the fuel concentration dependence, represented as X_{on} , was given by $n = 0.3$. Studies of soot aggregates found in these flames yielded higher values of volume-mean diameter, a larger surface area per unit volume, and lower values of the aggregate number concentration as compared to spherical particle assumptions. Operating pressure studies indicated that a power law representation of the form P_n , represented soot volume fraction dependence on the pressure, P , and confirmed the strong sensitivity of soot formation to pressure. Finally, high pressure diffusion flame studies revealed the onset of buoyant instabilities induced by changes in the pressure. A joint series of experiments and computations provided strong evidence to support that

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AD-A250 552 11/6.1 11/6.2 22/2 22/5

ILLINOIS UNIV AT URBANA DEPT OF MECHANICAL AND INDUSTRIAL ENGINEERING

(U) Non-Equilibrium Synthesis by Laser Cladding of Ni, Nb and Mg Alloys for Improved Environmental Resistance.

DESCRIPTIVE NOTE: Final rept. Nov 88-Oct 91,

MAR 92 91P

PERSONAL AUTHORS: Mazumder, J.; Kar, A.; Tewari, S. K.; Ribaudo, C. R.

CONTRACT NO. AFOSR-89-0061

PROJECT NO. 2306

TASK NO. A1

MONITOR: AFOSR, XF
TR-92-0305, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The technique of laser surface modification provides a unique means of synthesizing novel nonequilibrium materials in near net shape. The goal of the proposed program is to develop a science base for synthesis of nonequilibrium metastable alloys by laser processing. This report summarizes experimental and theoretical studies carried out during the period of November 1988 to October 1991 on laser surface modification of Ni, Nb and Mg alloys for improved environmental resistance at high temperature. A microstructural evolution model of NbAl₃ was developed and the relative oxidation resistance of claddings of several Nb-based alloys were investigated. Initial work with V revealed that V increases the ductility, and decreases the oxidation resistance of laser clad NbAl₃. Oxidation behavior of alloys with Ti, B and Hf as a ternary alloy addition were identified: Oxidation tests at 800, 1200, and 1400 deg C were conducted on NbAl₃-0 at %B (0 B), NbAl₃-0.5 at %B (0.5 B), NbAl₃-1.0 at %B (1.0 B), NbAl₃-1.0 at %Ti (3 Ti), NbAl₃-1.0 at %B-6 at %Ti (6 Ti) and NbAl₃-1.5 at %Hf (1.5 Hf) alloys. An external layer of (x-alumina formed on samples of alloys 0.5 B and 1.0 B isothermally oxidized in air at 800, 1200

and 1400 deg C. A mixture of alumina and NbAl₁₀4 formed on the samples of alloy 0 B exposed to same testing conditions.

DESCRIPTORS: (U) *CLADDING *LASERS *OXIDATION RESISTANCE, *AEROSPACE CRAFT, AIR, ALLOYS, BEHAVIOR, BINARY ALLOYS, BONDING, CHAMBERS, CONSTANTS, CORROSION, CORROSION RESISTANCE, DELIVERY, DUCTILITY, ENERGY, EXTERNAL, HIGH TEMPERATURE, IDENTIFICATION, INPUT, LAYERS, MATERIALS, METASTABLE ALLOYS, MICROSTRUCTURE, MIXTURES, MODELS, MODIFICATION, NETS, OXIDATION, OXIDES, OXYGEN, POWDERS, PROCESSING, RATES, RESISTANCE, SHAPE, SHIELDING, SURFACES, SYNTHESIS, TEMPERATURE, TEST AND EVALUATION, TERNARY COMPOUNDS, MAGNESIUM ALLOYS, NICKEL ALLOYS, NIOBIUM ALLOYS, MATHEMATICAL MODELS, LASER APPLICATIONS, THERMAL ANALYSIS, ST NGTH(MECHANICS), THERMAL STRESSES.

IDENTIFIERS: (U) WUAFOSR2306A1, PEG1102F, Ternary alloys.

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SEARCH CONTROL NO. T85005

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AD-A250 550

11/6

E-TEK DYNAMICS INC SAN JOSE CA

NORTHWESTERN UNIV EVANSTON IL

(U) Optical Computing and Optical Signal Processing. Phase 1.

(U) Quantum Mechanical Approach to Understanding Microstructural and Mechanical Properties in Intermetallics.

DESCRIPTIVE NOTE: Final rept. Oct 91-Apr 92.

DESCRIPTIVE NOTE: Final rept. 1 Oct 88-30 Sep 91.

APR 92

APR 92

143P

15P

PERSONAL AUTHORS: Pan, J. J.

PERSONAL AUTHORS: Freeman, Arthur J.

CONTRACT NO. F49620-91-C-0090

CONTRACT NO. AFOSR-88-0346

PROJECT NO. 1602

PROJECT NO. 2306

TASK NO. 01

TASK NO. A1

MONITOR: AFOSR, XF

TR-92-0404, AFOSR

MONITOR: AFOSR, XF

TR-92-0414, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) High efficient nonlinear optical materials (NOMS) are highly required for optical computing and optical signal processing. However, currently no such practical NOMS are available. In this project, new organic NOMS have been researched and developed. New organic NOM design principle and approach have been reviewed and investigated. Four new organic NOMs, namely, CWVI, DVDA, MOHNS and HMONS have been synthesized and purified. Nonlinear optical responses of these four samples have been demonstrated and preliminary been characterized. Device fabrication and application for optical computing and optical signal processing have been investigated. Nonlinear optics, organic materials, conjugation, polymer, transparency, nonlinear response device.

DESCRIPTORS: (U) *NONLINEAR OPTICS, *OPTICAL MATERIALS, FABRICATION, ORGANIC MATERIALS, POLYMERS, RESPONSE, SIGNAL PROCESSING, SIGNALS, TRANSPARENCIES.

IDENTIFIERS: (U) WUAFOSR160201, PE63218C, Optical materials.

ABSTRACT: (U) The primary goal of the proposed research is to study and develop alloying concepts for understanding intermetallic alloys as derived from a first principles quantum mechanical approach. Thus, a major part of our effort will be to study and determine ductilizing effects of alloying elements in several intermetallic compounds and to work closely with experimental efforts to evaluate the applicability of the theoretical approach to alloy design. Specifically, highly precise all-electron quantum mechanical electronic structure methods will be applied to the study of a number of materials problems in order to obtain from first principles information of relevance to alloy stability and the design of structural materials. Using our recently developed state-of-the-art all-electron self-consistent total energy methods which give precise solutions of the local density equations, fundamental information will be sought about the structural and electronic properties of these alloys in order to predict stable and metastable phases and how alloying affects bonding, crystal ordering and crystal symmetry. The first principles approach used here will address questions of a metallurgical nature, such as phase stability, crystal structure, equilibrium lattice constants, and mechanical properties including the effect of atomic relaxation. The

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proposed research seeks to explore a new capability for modeling materials and their properties on the computer which have not yet been made in practice.

DESCRIPTORS: (U) *INTERMETALLIC COMPOUNDS, *MICROSTRUCTURE, ALLOYS, APPROACH, BONDING, COMPUTERS, CONSTANTS, CRYSTAL STRUCTURE, CRYSTALS, DENSITY, ELECTRONICS, ELECTRONS, ENERGY, EQUATIONS, MATERIALS, MECHANICAL PROPERTIES, NUMBERS, PHASE, RELAXATION, STABILITY, STATE OF THE ART, STRUCTURES, SYMMETRY, ALUMINUM INTERMETALLICS, METALLURGY.

IDENTIFIERS: (U) WUAFOSR2306A1, PE61102F, *Intermetallic alloys.

AD-A250 549 12/2

TENNESSEE UNIV KNOXVILLE DEPT OF MATHEMATICS

(U) Non-Convex Problems in PDE: Equilibrium Theory and Dynamics.

DESCRIPTIVE NOTE: Final rept. 1 Apr-30 Sep 91,

SEP 91 8P

PERSONAL AUTHORS: Alikakos, Nicholas

CONTRACT NO. AFOSR-91-0232

PROJECT NO. 2304

TASK NO. CS

MONITOR: AFOSR, XF
TR-92-0412, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The main goal of the research discussed in this conference is a mathematical understanding of nonlinear dynamics appropriate for models of continua which admit phase transitions. The mathematical problems that were discussed addressed the general questions. How do nonlinear systems relax to equilibrium? How do interfaces and transition zones propagate? The speakers represented different aspects of the subject. The group included theoreticians as well as numerical analysts. The conference was very well attended and quite successful.

DESCRIPTORS: (U) *NONLINEAR DIFFERENTIAL EQUATIONS, DYNAMICS, INTERFACES, MODELS, NONLINEAR SYSTEMS, PHASE TRANSFORMATIONS, SYMPOSIA.

IDENTIFIERS: (U) WUAFOSR2304CS, PE61102F, Table of contents, *Equilibrium.

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AD-A250 522 21/1 19/9

SOCIETY FOR INDUSTRIAL AND APPLIED MATHEMATICS
PHILADELPHIA PA

TRW SPACE AND TECHNOLOGY GROUP REDONDO BEACH CA

(U) International Conference on Numerical Combustion (4th)
Held in St Petersburg, Florida on December 2 - 4, 1991.(U) Laser-Initiated Conical Detonation Wave for Supersonic
Combustion. III,

DESCRIPTIVE NOTE: Final rept. 1 Aug 91-31 Jan 92,

JUL 92 12P

PERSONAL AUTHORS: Carrier, G. F.; Fendell, F. E.; Chou, M.
S.

JAN 92 2P

PERSONAL AUTHORS: Block, Edward

CONTRACT NO. F49620-90-C-0070

CONTRACT NO. AFOSR-91-0306

PROJECT NO. 2308

PROJECT NO. 2304

TASK NO. BS

TASK NO. A3

MONITOR: AFOSR, XF
TR-92-0420, AFOSR

TR-92-0411, AFOSR

UNCLASSIFIED REPORT

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ABSTRACT: (U) The Fourth International Conference on Numerical Combustion was held on December 2-4, 1991, in St Petersburg, Florida. It was a sequel to the 1989 meeting in Antibes, the 1987 meeting in San Francisco, and the 1985 meeting in Sophia-Antipolis. Six invited lectures were given, by S. Correa (USA), T. Fujiwara (Japan), A. Ghoniem (USA), B. Larrouturou (France), M. Smooke (USA), and F. Williams (USA). The overwhelming consensus of the participants was that this was a valuable, high quality meeting, and the pattern of holding such a meeting every two years, alternating between the United States, and Europe should be continued.

DESCRIPTORS: (U) *COMBUSTION, *FIRES, EUROPE, FLORIDA, INTERNATIONAL, LECTURES, PATTERNS, QUALITY, UNITED STATES, SYMPOSIA, IGNITION, MATHEMATICAL MODELS, SUPERSONIC COMBUSTION, TURBULENCE, DETONATIONS.

IDENTIFIERS: (U) WUAFOSR2304A3, PE81102F, *Supersonic reacting flows, Asymptotics, Droplet analysis, Spray analysis, High speed propulsion, Laminar diffusion flames, *Numerical combustion.

AD-A250 548

UNCLASSIFIED

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ABSTRACT: (U) Further theoretical and experimental studies are undertaken of the feasibility of an air-breathing supersonic combustor based on a stabilized, conically configured (oblique) detonation wave. The conical wave is the resultant of the interaction of a train of spherical detonation waves, each directly initiated by a brief, localized deposition of energy from a very-rapidly-repeated pulsed laser. The laser is tightly focused on a fixed site (in the combustor) where there is a steady uniform supersonic stream of combustible gas. Simple analysis and laboratory experiments on the (nonintrusive) direct initiation of an individual spherical detonation wave by a single laser pulse are reported, with emphasis on the pulse-energy and pulse-duration parameters. Then, an estimate is given of the entropy production associated with the interaction of spherical detonations created in a supersonic reactive stream by a train of laser pulses. The entropy production, which arises from reflected shocks in already-detonated mixture, is reduced either by increasing the repetition rate of the laser or by increasing the flow speed the cold-gas mixture. Detonation Wave, Engine, Oblique Detonation Waves, Supersonic Combustion.

DESCRIPTORS: (U) *COMBUSTORS, *DETONATION WAVES, *PULSED LASERS, *SUPERSONIC COMBUSTION, ENERGY, ENGINES, ENTROPY, ESTIMATES, FLOW, INTERACTIONS, MIXTURES, RATES.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A250 522 CONTINUED

REPEITION RATE, STREAMS, VELOCITY, SPHERICAL WAVES,
REPRINTS, AIR BREATHING ENGINES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308BS, Conical waves,
*Oblique detonation waves, Gas mixtures.

AD-A250 519 20/3

AWARE INC CAMBRIDGE MA

(U) Wavelet Signal Processing for Transient Feature
Extraction.

DESCRIPTIVE NOTE: Final rept. 15 Sep 91-14 Jan 92.

MAR 92 84P

PERSONAL AUTHORS: Jagler, Karl B.

REPORT NO. AD920315

CONTRACT NO. F49620-91-C-0089

PROJECT NO. 2500

TASK NO. 00

MONITOR: AFOSR, XF
TR-92-0402, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Research was conducted to evaluate the
feasibility of applying Wavelets and Wavelet Transform
methods to transient signal feature extraction problems.
Wavelet transform techniques were developed to extract
low dimensional feature data that allowed a simple
classification scheme to easily separate the various
signals of interest. Additional development of these
techniques will lead to robust feature extraction methods
for transient signals.

DESCRIPTORS: (U) *SIGNAL PROCESSING, *FOURIER ANALYSIS,
CLASSIFICATION, EXTRACTION, SIGNALS, TRANSIENTS, SCALING
FACTOR, TARGET CLASSIFICATION.

IDENTIFIERS: (U) PE61102F, WUAFOSR250000, Feature
extraction, Fourier analysis.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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TEXAS A AND M UNIV COLLEGE STATION DEPT OF MECHANICAL
ENGINEERING SOLIDS, SPATIAL DISTRIBUTION, WORK.

(U) The Mechanics of Fractal Damage.

DESCRIPTIVE NOTE: Final rept.,

MAR 92 35P

PERSONAL AUTHORS: Anderson, Ted L.; Yongqi, Sun

REPORT NO. CMC-6730-15

CONTRACT NO. AFOSR-90-0373

MONITOR: AFOSR, XF
TR-92-0397, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This report describes a preliminary investigation of the applicability of fractal geometry to damage modeling. Microstructural heterogeneity, both the size distribution and spatial distribution of microstructural features, can be modeled simply and compactly with a fractal dimension. The ultimate goal of this research is the development of an alternative to continuum damage and micromechanics models. The scaling nature of fractal geometry may aid the development of models that connect microscale damage with global mechanical response. An assumed fractal size distribution of microcracks in a brittle solid was used to derive the Weibull distribution for strength, and a relationship between the Weibull shape parameter and the fractal dimension of the flaw distribution was obtained. Published data on the strength of glass fibers were consistent with a fractal flaw distribution. Stable damage evolution in tougher materials with fractal microstructures was also considered. Although preliminary results are promising, further work is necessary to develop the concepts of fractal damage more fully. Damage Mechanics, Micromechanics, Composite Materials, Fractal Geometry.

DESCRIPTORS: (U) *COMPOSITE MATERIALS, *FRACTALS, DAMAGE, DISTRIBUTION, FIBERS, GEOMETRY, GLASS, GLASS FIBERS, GLOBAL, HETEROGENEITY, MATERIALS, MECHANICS, MICROBALANCES, MODELS, PARAMETERS, RESPONSE, SHAPE.

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MASSACHUSETTS INST OF TECH CAMBRIDGE RESEARCH LAB OF ELECTRONICS

MARYLAND UNIV COLLEGE PARK SYSTEMS RESEARCH CENTER

(U) Femtosecond Photonics: Fundamental Phenomena and Device Behavior.

(U) Signal Processing and Recognition in Adaptive Neural Networks.

DESCRIPTIVE NOTE: Final rept. 1 Aug 88-31 Jul 91.

DESCRIPTIVE NOTE: Final rept. 1 Aug 88-31 Jul 91.

FEB 92 24P

JUL 91 24P

PERSONAL AUTHORS: Ippen, E. P.; Fujimoto, J. G.; Haus, H. A.

PERSONAL AUTHORS: Shamma, Shihab A.; Krishnaprasad, P. S.

CONTRACT NO. F49620-88-C-0089

CONTRACT NO. AFOSR-88-0204

PROJECT NO. 2301

PROJECT NO. 2313

TASK NO. A1

TASK NO. A8

MONITOR: AFOSR, XF
TR-92-0282, AFOSRMONITOR: AFOSR, XF
TR-92-0357, AFOSR

UNCLASSIFIED REPORT

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ABSTRACT: (U) This report describes a number of different research projects carried out under this contract. Emphasis is placed on progress made during the third and final year; but a listing of publication and reports covering all three years of the contract is attached. Titles of the individual projects herein include: Picosecond Optical Switching, Additive Pulse Modelocking in Diode Pumped Nd: YAG and YLF, Multistage High Repetition Rate Femtosecond Amplifiers, Control and Spontaneous Emission with Semi-conductor Microcavities, Carrier Dynamics in metals and Semiconductors, Time Domain Interferometry, Nonlinear Dynamics in Active Semiconductor Devices, Four Wave Mixing and Information in Photorefractive Crystals and Impulsive Excitation of Coherent Phonons. (Author)

DESCRIPTORS: (U) *PULSED LASERS, *COHERENT OPTICAL RADIATION, OPTICAL SWITCHING, NEODYMIUM LASERS.

IDENTIFIERS: (U) WUAFOSR2301A1.

DESCRIPTORS: (U) *NEURAL NETS, *SIGNAL PROCESSING, HEARING, PSYCHOACOUSTICS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A8.

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PRINCETON UNIV NJ DEPT OF ELECTRICAL ENGINEERING AND
COMPUTER SCIENCE

(U) Fault Tolerant Parallel Computing in Orthogonal Shared-
Memory and Related Architectures.

DESCRIPTIVE NOTE: Final technical rept. 1 Jan 90-31 Dec
91,

APR 92 11P

PERSONAL AUTHORS: Jha, Niraj K.; Scherson, Isaac D.

CONTRACT NO. AFOSR-90-0144

PROJECT NO. 2304

TASK NO. A2

MONITOR: AFOSR, XF
TR-92-0368, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The aim of the research summarized in this final report was to investigate a class of orthogonal shared-memory architectures and interconnection networks, and to obtain generalized methods for implementing algorithm-based fault tolerance (ABFT) on multiprocessor architectures. We proposed a theory based on orthogonal graphs to represent many well-known interconnection networks such as the binary m-cube, spanning-bus meshes, multistage interconnection networks, etc. A previously proposed multiprocessor architecture called the Orthogonal Multiprocessor (OMP) is also a special case of this method. The simplicity of the graph construction rules permits us to characterize and understand the differences and similarities among networks like the SW-banyan, the baseline network, among others. This opens the way for discovering new structures by studying different possible combinations of the parameters which define orthogonal graphs.

DESCRIPTORS: (U) *FAULT TOLERANT COMPUTING,
*ORTHOGONALITY, *COMPUTER ARCHITECTURE, COMPUTER NETWORKS,
MULTIPROCESSORS, ALGORITHMS, SHARING, INSTALLATION.

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A2.

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CASE WESTERN RESERVE UNIV CLEVELAND OH SCHOOL OF
ENGINEERING

(U) Crack Propagation and Fabric Control on the Static and
Dynamic Strength of Cohesive Soils. Appendix.

DESCRIPTIVE NOTE: Technical rept..

JAN 92 158P

PERSONAL AUTHORS: Saada, Adel S.; Bianchini, Gary F.

CONTRACT NO. AFOSR-88-0169

MONITOR: AFOSR, XF
TR-92-0362-APP, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This report contains Appendices I through IX which consist of data obtained from soil tests. The cell pressure during K sub o consolidation was 620 kPa resulting in a vertical stress of 1240 kPa. The rebound was such that the excess vertical stress was removed and the cell pressure reduced by a factor of 3. This operation leads to an overconsolidation ratio of 4 when reference is made to the mean effective stress. For isotropic specimens consolidation and rebound were spherical in nature. The specimen was hydrostatically consolidated under 620 kPa and rebounded to 207 kPa.

DESCRIPTORS: (U) *COHESIVE SOILS, *STRENGTH(MECHANICS), *SOIL MECHANICS, CRACK PROPAGATION, CLAY, SOIL TESTS, VOIDS, SHEAR STRESSES, SHEAR STRENGTH, COMPRESSIVE PROPERTIES, STRAIN(MECHANICS), PORE PRESSURE, RESONANT FREQUENCY, TORQUE, ROTATION, VOLUME, MODULUS OF ELASTICITY, DAMPING, EXCITATION, MOISTURE CONTENT, DEFORMATION.

IDENTIFIERS: (U) Overconsolidation,
Compressibility(Soils), Axial loads, Axial stress,
Consolidation(Soils).

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MASSACHUSETTS INST OF TECH CAMBRIDGE

CARNEGIE-MELLON UNIV PITTSBURGH PA DEPT OF MATHEMATICS

(U) New Directions in Network Flows.

(U) New Techniques in Computational Fluid Dynamics:
Algorithms, Analysis, Applications.

DESCRIPTIVE NOTE: Final rept. 1 Jan 88-31 Dec 91,

DESCRIPTIVE NOTE: Final rept. 1 Jun 89-31 Dec 91,

MAR 92

7P

DEC 91

5P

PERSONAL AUTHORS: Orlin, James B.

PERSONAL AUTHORS: Nicolaides, R. A.

CONTRACT NO. AFOSR-88-0088

CONTRACT NO. AFOSR-89-0359

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. B1

TASK NO. A3

MONITOR: AFOSR, XF
TR-92-0352, AFOSR

MONITOR: AFOSR, XF
TR-92-0353, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) A new, fast algorithm has been developed for the solution of problems using Lagrangian relaxation. This algorithm appears to improve running times by a factor of n -squared, where n is the number of variables.

DESCRIPTORS: (U) *NETWORK FLOWS, *ALGORITHMS, PROBLEM SOLVING, RELAXATION, VARIABLES, LAGRANGIAN FUNCTIONS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304B1.

ABSTRACT: (U) The overall goal of this research was the development and application of covolume methodology in CFD and related areas. The main framework of the covolume approach is now in place and its major characteristics are reasonably well understood. The research shows the algorithm to be a stable and accurate approach to computing viscous fluids on unstructured meshes. The covolume approach has several unique features, including an associated discrete vector field theory, which in turn permits covolume discretizations to exhibit important physical characteristics, for example being free of artificial vorticity creation. There is still need for work in compressible and three dimensional flows.

DESCRIPTORS: (U) *FLUID DYNAMICS, *COMPUTATIONS, *VISCOUS FLOW, ALGORITHMS, COMPRESSIBLE FLOW, THREE DIMENSIONAL FLOW, MESH, MAXWELLS EQUATIONS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304A3.

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CALIFORNIA UNIV LOS ANGELES DEPT OF ELECTRICAL
ENGINEERING

(U) Compact Millimeter-Wave Devices: Dielectric Loaded
Carm, High Voltage Carm, Slow Wave crm and High
Harmonic Gyrotron.

DESCRIPTIVE NOTE: Final rept. 1 Dec 89-30 Nov 91,

NOV 91

PERSONAL AUTHORS: Luhmann, Neville, Jr

CONTRACT NO. AFOSR-90-0005

PROJECT NO. 2301

TASK NO. A8

MONITOR: AFOSR, XF
TR-92-0350, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) A gyro-BWO can provide broadband slow
timescale tunability by adjusting the magnetic field and
fast narrowband tunability by varying the gun's voltage.
This device depends on the internal feedback of the fast
wave interaction between the electro beam's cyclotron
resonance wave and a backward electromagnetic wave.
Although the previous two experiments were operated at kW
power levels, a gyro-BWO is capable of much higher power.

DESCRIPTORS: (U) *BACKWARD WAVE OSCILLATORS, *TUNING
DEVICES, ELECTRON GUNS, CYCLOTRON RESONANCE.

IDENTIFIERS: (U) WUAFOSR2301A8.

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CONNECTICUT UNIV STORRS DEPT OF ELECTRICAL AND SYSTEMS
ENGINEERING

(U) Estimation with Multisensor/Multiscan Detection Fusion.
DESCRIPTIVE NOTE: Final rept. 1 Aug 91-31 Jan 92,

MAR 92

19P

PERSONAL AUTHORS: Bar-Shalom, Y.; Pattipati, K. R.

CONTRACT NO. AFOSR-91-0292

PROJECT NO. 2304

TASK NO. A8

MONITOR: AFOSR, XF
TR-92-0372, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) In this paper we present an algorithm to
solve the static problem of associating data from three
spatially distributed heterogeneous sensors, each with a
set of detections at the same time. The sensors could be
active (3D or 2D radars) or passive (EO sensors measuring
the azimuth and elevation angles of the source). The
source of a detection can be either a real target, in
which case the measurement is the true observation
variable of the target plus measurement noise, or a
spurious one, i.e., a false alarm. In addition, the
sensors may have nonunity detection probabilities. The
problem is to associate the measurements from the sensors
to identify the 'real' targets, and to obtain their
position estimates. Mathematically, this (static)
measurement-target association problem leads to a
generalized three-dimensional (3-D) matching problem,
which is known to be NP-hard. In this paper, we present a
fast, but near-optimal 3-D matching algorithm suited for
estimating the positions of a large number of targets
(>50) in a dense cluster for real-time applications.
Performance results on several representative test cases
solved by the algorithm are presented. (Author)

DESCRIPTORS: (U) *RADAR, *OPTICAL DETECTION, DETECTION,
AUTOMATIC TRACKING, ALGORITHMS.

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IDENTIFIERS: (U) PE61102F, WUAFOSR2304A8.

ILLINOIS UNIV AT URBANA CENTER FOR SUPERCOMPUTING
RESEARCH AND DEVELOPMENT

(U) Analysis and Design of Neural Networks.

DESCRIPTIVE NOTE: Final rept. 30 Sep 89-29 Sep 91.

JAN 92 8P

PERSONAL AUTHORS: Cybenko, George; Kumar, P. R.

CONTRACT NO. AFOSR-89-0536

PROJECT NO. 7013

TASK NO. DA

MONITOR: AFOSR, XF
TR-92-0355, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The training problem for feedforward neural networks is nonlinear parameter estimation that can be solved by a variety of optimization techniques. Much of the literature of neural networks has focused on variants of gradient descent. The training of neural networks using such techniques is known to be a slow process with more sophisticated techniques not always performing significantly better. It is shown that feedforward neural networks can have ill-conditioned Hessians and that this ill-conditioning can be quite common. The analysis and experimental results lead to the conclusion that many network training problems are ill-conditioned and may not be solved more efficiently by higher order optimization methods. The analysis are for completely connected layered networks, they extend to networks with sparse connectivity as well. The results suggest that neural networks can have considerable redundancy in parameterizing the function space in a neighborhood of a local minimum, independently of whether or not the solution has a small residual.

DESCRIPTORS: (U) *COMPUTER NETWORKS, *SYSTEMS
ENGINEERING, OPTIMIZATION, PROBLEM SOLVING, EXPERIMENTAL
DATA, NONLINEAR ANALYSIS, PARAMETRIC ANALYSIS, ESTIMATES.

IDENTIFIERS: (U) PE61102F, WUAFOSR7013DARPA, *Neural

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networks.

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AD-A250 488 5/7 5/8

OREGON UNIV EUGENE DEPT OF PSYCHOLOGY

(U) Sylvia Beach Language Comprehension Conference 1990.

DESCRIPTIVE NOTE: Final technical rept. 15 Apr 90-14 Apr 92.

APR 92 25P

PERSONAL AUTHORS: Gernsbacher, Morton A.

CONTRACT NO. AFOSR-90-0272

PROJECT NO. 2313

TASK NO. A4

MONITOR: AFOSR, XF
TR-92-0348, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) A conference was held for internationally-known scholars in the field of language comprehension. It was a small, intense, two-and-a-half day conference in which participants had the opportunity to interact both formally and informally. Each participant gave a 30-minute talk overviewing the current state of his or her research. A thirty-minute round-table talk discussion followed each set of two talks.

DESCRIPTORS: (U) *LANGUAGE, *COMPREHENSION, SPEECH RECOGNITION, READING, PERCEPTION, SYNTAX, WORDS(LANGUAGE), GRAMMARS, SYMPOSIA.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A4, Idioms.

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WEST CHESTER UNIV PA DEPT OF MATHEMATICS AND COMPUTER SCIENCE

(U) Algorithms for the Determination of Spatial and Spectral Distribution of Electromagnetic Energy in a Simulated Biostructure Subjected to Transient Spatially Heterogeneous Radiation with Applications to Radar Hazard Assessment and Cancer Therapy.

92 310P

PERSONAL AUTHORS: Cohoon, D. K.

CONTRACT NO. AFOSR-90-0183

PROJECT NO. 6177

TASK NO. 57

MONITOR: AFOSR, XF
TR-92-0290, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) There is concern that high power sources of electromagnetic radiation may cause physical harm to an exposed individual even when the frequencies are below those of X rays. Specifically concerns arise in the use of microwave equipment, radars, lasers, active imaging devices and transmitters. Early efforts to address this question considered total absorbed power and then local internal temperature increases; Computer algorithms to make these predictions were developed by USAF/SAM. Recently, as-equipment with small duty cycles and very high peak power have been developed, concerns over the effect of sweeping fields and electromagnetic transients on biological-structures have arisen. The algorithm developed in this report has as its purpose a highly accurate benchmark code which will predict the response of an N layer bianisotropic spherical structure to multiple plane waves with different amplitudes, frequencies, polarizations, and directions of travel and full wave solutions involving all of the pm sub n. Bioelectromagnetics, hazard assessment, cancer therapy, bianisotropy, temperature prediction, full wave solutions, Mie like solution.

DESCRIPTORS: (U) *ALGORITHMS, *ELECTROMAGNETIC RADIATION,

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*HAZARDS, CANCER, COMPUTERS, CYCLES, HIGH POWER, INTERNAL, LASERS, LAYERS, MICROWAVE EQUIPMENT, MICROWAVES, PEAK POWER, PLANE WAVES, POWER, PREDICTIONS, RADAR, RADIATION, RESPONSE, STRUCTURES, TEMPERATURE, THERAPY, TRANSIENTS, TRANSMITTERS, TRAVEL, X RAYS, BIOLOGICAL CONTAMINATION.
IDENTIFIERS: (U) PE62202F, WUAFOSR617757.
*Bioelectromagnetics, Cancer theory.

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WRIGHT STATE UNIV DAYTON OH DEPT OF COMPUTER SCIENCE AND ENGINEERING

VIRGINIA UNIV CHARLOTTESVILLE DEPT OF BIOLOGY

(U) Ariel Database Rule System Project.

(U) Control of Circadian Behavior by Transplanted Suprachiasmatic Nuclei.

DESCRIPTIVE NOTE: Final rept. 15 Apr 89-14 Jan 92,

DESCRIPTIVE NOTE: Annual rept. 15 Nov 90-15 Aug 91,

JAN 92 14P

AUG 91 4P

PERSONAL AUTHORS: Hanson, ERIC N.

PERSONAL AUTHORS: Menaker, Michael

CONTRACT NO. AFOSR-89-0286

CONTRACT NO. AFOSR-90-0098

PROJECT NO. 2304

PROJECT NO. 2312

TASK NO. A7

TASK NO. CS

MONITOR: AFOSR, XF

MONITOR: AFOSR, XF

TR-92-0272, AFOSR

TR-92-0410, AFOSR

UNCLASSIFIED REPORT

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ABSTRACT: (U) The Ariel project has culminated in several advancements in active database technology, and the development of a working prototype active database system. Ariel is unique in its support for efficient rule condition testing based on a discrimination network, and its tight integration of rule processing with database transaction processing. An efficient index for testing single relation selection predicates was developed, which also resulted in the development of two new types of interval index data structures, the interval binary search tree, and the interval skip-list. For testing join conditions, a modified version of the TREAT algorithm, called A-TREAT, was developed. A-TREAT is suitable for use in a database environment. It's major new feature that makes it suitable for databases is the concept of virtual alpha-memory nodes, which, unlike normal alpha-memories, do not contain the data matching the associated selection predicate. Instead, virtual alpha-memories contain only the predicate.

DESCRIPTORS: (U) *ALGORITHMS, *DATA BASES, DISCRIMINATION, ENVIRONMENTS, INDEXES, INTEGRATION, INTERVALS, MATCHING, NETWORKS, NODES, PROCESSING, PROTOTYPES, SELECTION, STRUCTURES, TREES.

IDENTIFIERS: (U) WUAFOSR2304A7, PE81102F.

AD-A250 443

ABSTRACT: (U) A genetic mutation has been found that alters the free running period of the locomotor activity rhythm from the wild-type value of =24 hours to =20 hours in homozygous mutants. Our data suggest the existence of two qualitatively different rhythmic outputs from the circadian oscillators contained with the SCN. One of these outputs stimulates the expression of locomotor activity producing activity rhythm's (which are seen within), and the other suppresses the expression of activity, restricting its appearance to a temporally defined window and thereby defining the boundaries of p'. The idea that one function of a circadian output from the SCN is to suppress activity is novel.

DESCRIPTORS: (U) *GENETICS, *MUTATIONS, BOUNDARIES, FUNCTIONS, OSCILLATORS, OUTPUT, VALUE, WINDOWS, CIRCADIAN RHYTHMS.

IDENTIFIERS: (U) WUAFOSR2312CS, PE81102F, Locomotor activity, Homozygous mutants.

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GEORGIA INST OF TECH ATLANTA SCHOOL OF PHYSICS

(U) Electron-Hydrogen Collisions with Dressed Target and Volkov Projectile States in a Laser Field,

92

30P

PERSONAL AUTHORS: Smith, Philip H.; Flannery, M. R.

REPORT NO. GIT-89-009

CONTRACT NO. AFOSR 89-0426

PROJECT NO. 2301

TASK NO. A4

MONITOR: AFOSR, XF
TR-92-0329, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Physics B: Atomic and Molecular Physics, v25 p1021-1049 1992. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) Cross sections for the 1S-2S and 1S-2Po transitions in laser-assisted, e-H(1S) collisions are calculated in both the multichannel eikonal treatment and the Born wave approximation, as a function of impact energy and laser field intensity. The laser considered is a monotonic, plane-polarized CO2 laser (photon energy = 0.117 eV) with the polarization direction parallel to the initial projectile velocity. The first part of this paper confines the laser perturbation to the bound electrons of the atom. A semiclassical Floquet approach is used to dress the hydrogen atom in this soft-photon weak-field regime, and is shown to reveal a concise description of the laser-assisted collision. The Floquet dressing is compared to dressing by the traditional time-dependent perturbation theory, showing that the perturbative approach gives an incomplete description of the laser interaction, and cannot predict the distinct features provided by the Floquet approach. The second part of the paper extends the laser perturbation to the projectile electron, and the familiar Volkov dressed states are used. Although in the range of impact energies and electric field strengths considered the Volkov dressed states

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exert significant influence on the cross sections for individual state-to-state transitions, which involves absorption or emission of a given number of photons, they have only a negligible effect on the cross sections when summed over all absorptions and emissions. Special attention is given to synchronizing the time frame of the laser field with the time frame of the trajectory of the collisional species orbit. This requires the inclusion of a phase shift within the vector potential of the laser field. This inclusion is important when comparing theoretical cross sections with cross section measurements.

DESCRIPTORS: (U) *PARTICLE COLLISIONS, CARBON DIOXIDE LASERS, SCHRODINGER EQUATION, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2301A4, *Laser fields, Born wave approximation, *Projectile atom collisions, Volkov states.

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GEORGIA INST OF TECH ATLANTA SCHOOL OF PHYSICS

SECTIONS, ATOMIC PROPERTIES, REPRINTS.

(U) Electron-Hydrogen Collisions in a Laser Field,

IDENTIFIERS: (U) PEG1102F, WUAFOSR2301A4, Laser fields,
Electron hydrogen collisions, Multiphoton ionizations.

91

7P

PERSONAL AUTHORS: Smith, Philip H.; Flannery, M. R.

REPORT NO. GIT-89-010

CONTRACT NO. AFOSR-89-0426

PROJECT NO. 2301

TASK NO. A4

MONITOR: AFOSR, XF
TR-92-0330, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Physics B: Atomic and
Molecular Physics, v24 pL489-L494 1991. Available only to
DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) The Floquet treatment has already been
successfully employed (Chu 1985, Potvliege and Shakeshaft
1991) in calculations of laser-induced multiphoton
ionizations, where it provides dressed states for an atom
in a laser field. The (perturbative) dressing of target
states can have important consequences in laser-assisted
scattering was illustrated by Byron and Joachain (1984).
These dressed states are useful, not only for laser-
induced phenomena, but also as a collisional basis set
for laser-assisted collisions. In this role they are in
fact very appealing, since the Floquet treatment
naturally lends itself to a time-independent analysis,
and hence are compatible with present field-free
scattering theories. Despite the apparent applicability
of this approach, work along these lines has only just
recently appeared (Sharma and Mohan 1990, Smith and
Flannery 1991a, Burke et al 1991). Byron and Joachain
(1984) have illustrated that perturbative dressing of the
target states can have important consequences in laser-
assisted scattering. Floquet dressing however provides a
more complete description (Smith and Flannery 1991b).

DESCRIPTORS: (U) *IONIZATION, *SEMICONDUCTORS, CROSS

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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GEORGIA INST OF TECH ATLANTA SCHOOL OF PHYSICS

(U) Electron-Atom Collisions in a Laser Field,

91 5P

PERSONAL AUTHORS: Smith, Philip H.; Flannery, M. R.

REPORT NO. GIT-89-011

CONTRACT NO. AFOSR-89-0426

PROJECT NO. 2301

TASK NO. A4

MONITOR: AFOSR, XF
TR-92-0331, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Nuclear Instruments and Methods in Physics Research, V856/57 p166-169 1991. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) The work reported in this paper is a study of the influence of the laser field on electron-atom collisions in the soft-photon weak-field regime. In this regime the photon energy is a lot less than the energy required to ionize the atom, and the field strengths can always be considered as a perturbation to the field of the nucleus on the bound electrons. The effect of coupling a laser field to a projectile electron in this regime during a collision with an atom has been well explained in a number of studies. The effect of a laser field on the target atom, however, has met with a lot less success. This is due to the off-diagonal elements introduced into the Schrodinger equation for an atom in a laser field, which not only provide couplings between eigenstates of the isolated atom, but simultaneously involve the absorption or emission of a photon.

DESCRIPTORS: (U) *LASERS, *RECOMBINATION REACTIONS, PHOTONS, PHOTONUCLEAR REACTIONS, PROJECTILES, REPRINTS.

IDENTIFIERS: (U) PEB1102F, WUAFOSR2301A4, Laser fields, Electron atom collisions, Soft Photons.

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UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES LOKER
HYDROCARBON RESEARCH INST

(U) Synthesis and Polymerization of 5-Silaspiro(4.4)nona-2,7-dienes,

91 7P

PERSONAL AUTHORS: Park, Young T.; Zhou, Steven Q.; Manuel, Georges; Weber, William P.

CONTRACT NO. AFOSR-89-0007

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR, XF
TR-92-0327, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Macromolecules, V24 n11 p3221-3226 1991. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) Symmetrical and unsymmetrical 5-silaspiro(4.4)nona-2,7-dienes have been prepared. Ring-opening reactions of these dienes catalyzed by alkylaluminum reagents and hexamethylphosphoramide (HMPA) in THF lead to dimers, oligomers, and polymers of unusual structure. Thermal degradation of these results in high char yields. Polymerization of 5-silaspiro(4.4)nona-2,7-dienes. Thermal degradation. High char yields.

DESCRIPTORS: (U) *POLYMERIZATION, *THERMAL DEGRADATION, DEGRADATION, DIENES, DIMERS, OLIGOMERS, POLYMERS, STRUCTURES, REPRINTS.

IDENTIFIERS: (U) PEB1102F, WUAFOSR230382, 5-Silaspiro 4.4 nona-2,7-dienes, Ring opening reactions, High char yields.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES LOKER
HYDROCARBON RESEARCH INST

(U) Bromide Ion Catalyzed Dimerization of 3,3-Diphenyl-6-oxa-3-silabicyclo(3.1.0)hexane. Structure Determination and Ring Contraction of 2,2,6,6-Tetraphenyl-4,8-divinyl-1,5-dioxo-2,6-disilacyclooctane and Synthesis of 2,2,4,4-Tetraphenyl-6-vinyl-1,3-dioxo-2,4-disilacyclohexane,

91 7f

PERSONAL AUTHORS: Park, Young T.; Manuel, Georges; Bau, Robert; Zhao, Dong; Weber, William P.

CONTRACT NO. AFOSR-89-0007

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR, XF
TR-92-0336, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Organometallics, v10 n5 p1586-1591 1991. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) Bromide ion catalyzed dimerization of 3,3-diphenyl-6-oxa-3-silabicyclo(3.1.0)hexane (I) yields cis- and trans-2,2,6,6-tetraphenyl-4,8-divinyl-1,5-dioxo-2,6-disilacyclooctane (II). The structure of trans-II has been determined by a combination of ¹H, ¹³C, and ²⁹Si NMR spectroscopy and X-ray crystallography. The structure was refined to a final agreement factor of 0.055 for 1374 reflections. Pyrolysis of II at 150 deg C yields 2,2,4,4-tetraphenyl-6-vinyl-1,3-dioxo-2,4-disilacyclohexane (III) and 1,3-butadiene. (Author)

DESCRIPTORS: (U) *ORGANOMETALLIC COMPOUNDS, *SILICATES, *BROMIDES, *IONS, *CYCLOHEXANES, *CYCLOOCTANES, *CATALYSIS, *PHENYL RADICALS, *DIMERS, *VINYL RADICALS, REPRINTS, CRYSTAL STRUCTURE, SYNTHESIS(CHEMISTRY).

IDENTIFIERS: (U) PE81102F, WUAFS0R2303B2, *Ring contraction, *Dimerization.

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AD-A250 413 7/4 20/8 11/7
PITTSBURGH UNIV PA SURFACE SCIENCE CENTER
(U) Electron-Stimulated Desorption: Principles and Applications,

JUN 91 139P

PERSONAL AUTHORS: Ramsier, R. D.; Yates, J. T., Jr

CONTRACT NO. AFOSR-82-0133

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR, XF
TR-92-0340, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Surface Science Reports, v12, nos 6-8 1991. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) The desorption of surface-bound species induced by electronic excitation mechanisms is a fascinating phenomenon of fundamental as well as technological importance. This article summarizes the wealth of knowledge that has been gained through studies of low-energy electron-stimulated desorption (ESD) of atoms, molecules, and molecular fragments from a variety of adsorbate/substrate systems. A survey of popular theoretical models often invoked to explain ESD phenomena is presented, followed by a brief discussion of the experimental aspects of a variety of ESD measurements. Specific literature examples are then highlighted to illustrate the usefulness of ESD techniques in elucidating the bonding geometry and surface dynamics of adsorbed species. Finally, a bibliography of published literature in the field is included as an appendix.

DESCRIPTORS: (U) *ELECTRONS, *STIMULATION(GENERAL), *SURFACE ANALYSIS, DESORPTION, EXCITATION, LOW ENERGY, REPRINTS, ATOMS, MOLECULES, SUBSTRATES, ADSORBATES, BONDING, GEOMETRY.

IDENTIFIERS: (U) *ESP(Electron Stimulated Desorption), Molecular fragments, Alkali-Halide Excitation, PE61102F,

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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WUAFOSR2303A2.

AD-A250 410 11/4 20/11

VIRGINIA POLYTECHNIC INST AND STATE UNIV BLACKSBURG DEPT
OF ENGINEERING SCIEN CE AND MECHANICS

(U) Role of Interfaces and Interphases in the Evolution
Mechanics of Material Systems.

DESCRIPTIVE NOTE: Final rept. 1 Dec 90-1Dec 91,

MAR 92 173P

PERSONAL AUTHORS: Reifsnider, K.; Stinchcomb, W.; Dillard,
D.; Swain, R.; Jayaraman, K.

CONTRACT NO. AFOSR-89-0216

PROJECT NO. 2302

TASK NO. BS

MONITOR: AFOSR
TR-92-0398

UNCLASSIFIED REPORT

ABSTRACT: (U) The general objective of this investigation was to apply the discipline of mechanics to the prediction and description of the long-term behavior of composite materials by developing experimental information, conceptual understanding, and analytical representations of the evolution of the properties of constituent materials and interfaces in composite material systems as a function of time during the application of time-variable mechanical, thermal, and chemical loadings. The general approach to this objective was to develop mechanistic representations of the 'state of the material' under those conditions, and to join those descriptions with micromechanical descriptions of the 'state of stress' in 'critical elements' to support an estimate of remaining strength, and thereby, to predict remaining life. The current program focused on the 'Role of Interfaces and Interphases in the Evolution Mechanics of material Systems.' The objective of the program was to achieve accurate and realistic representations of the geometry, arrangement, properties, and property distributions (as a function of space) associated with the region between fibers and matrix material in continuous and short fiber reinforced composite materials, to develop engineering methods of

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AD-A250 410 CONTINUED

characterizing the interphasal strength, and to use a critical element method to extend these findings to the prediction of the changes in stiffness and strength.

DESCRIPTORS: (U) *MATRIX MATERIALS, *FIBER REINFORCED COMPOSITES, *LAMINATES, *INTERFACES, *MECHANICAL PROPERTIES, *EPOXY COMPOSITES, STIFFNESS, CREEP, THERMOPLASTIC RESINS, LOADS(FORCES), THERMAL STRESSES, STRESS ANALYSIS, STRENGTH(MECHANICS), MECHANICS, DIFFUSION, CHEMICAL REACTIONS, POLYMERS, FATIGUE LIFE, DELAMINATION, STRESS STRAIN RELATIONS, RADIOGRAPHY.

IDENTIFIERS: (U) WUAFOSR2302BS, PEG1102F, Micromechanics, Compressive strength.

AD-A250 409 20/4

STANFORD UNIV CA DEPT OF MECHANICAL ENGINEERING

(U) Interaction of Isotropic Turbulence with a Shock Wave.

DESCRIPTIVE NOTE: Final rept. 1 Jan 89-31 Dec 91,

MAR 92 237P

PERSONAL AUTHORS: Lee, S.; Moin, P.; Lele, S. K.

CONTRACT NO. AFOSR-89-0249

PROJECT NO. 2307

TASK NO. AS

MONITOR: AFOSR
TR-92-0408

UNCLASSIFIED REPORT

ABSTRACT: (U) As a first step to understand the compressibility effects, interaction of isotropic quasi-incompressible turbulence with a weak shock wave was studied by three-dimensional time-dependent direct numerical simulations. In addition, linear analysis was used to study interaction of isotropic turbulence with shock waves of a wide range of strengths. The effects of the fluctuation Mach number $M_{sub t}$ and the average Mach number $M_{sub 1}$ superscript u of the upstream turbulence on turbulence statistics were investigated. Both numerical simulations and linear analyses of the interaction show that turbulence is enhanced during the interaction with a shock wave. Turbulent kinetic energy (TKE) and transverse vorticity components are amplified, and turbulent length scales are decreased. The predictions of the linear analyses compare favorably with simulation results for flows with $M_{sub t} < M_{sub 1}$ superscript u , which suggests that the amplification mechanism is mainly linear.

DESCRIPTORS: (U) *SHOCK WAVES, *DIGITAL SIMULATION, TURBULENCE, COMPRESSIBLE FLOW, THREE DIMENSIONAL FLOW, MACH NUMBER, KINETIC ENERGY.

IDENTIFIERS: (U) TKE(Turbulent Kinetic Energy), WUAFOSR2307AS, PEG1102F.

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AD-A250 402 14/3 13/8

AD-A250 401 5/8

MINNESOTA UNIV MINNEAPOLIS DEPT OF PHYSICS

MINNESOTA UNIV MINNEAPOLIS DEPT OF PSYCHOLOGY

(U) Epitaxial Iron Films.

(U) Human Image Understanding.

DESCRIPTIVE NOTE: Final rept. 15 Dec 88-15 Dec 91,

DESCRIPTIVE NOTE: Final rept. 1 Jun 88-1 Jan 92,

FEB 92 13P

APR 92 27P

PERSONAL AUTHORS: Dahlberg, E. D.; Cohen, P. I.

PERSONAL AUTHORS: Biederman, Irving

CONTRACT NO. AFOSR-89-0248

CONTRACT NO. AFOSR-88-0231

PROJECT NO. 2306

PROJECT NO. 2313

TASK NO. C1

TASK NO. A5

MONITOR: AFOSR, XF
TR-92-0276, AFOSRMONITOR: AFOSR, XF
TR-92-0360, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) This research involved studies of the magnetic properties of multilayered magnetic films and high quality thin. Both ultra high vacuum sputtering and molecular beam epitaxy techniques were utilized to prepare the films. Both electrical transport and magneto-optic effects were used to measure the magnetic properties of the films. The focus was determination of the temperature dependence of the magnetic anisotropy energies of epitaxial iron films, the magnetization dynamics of thin films, and the transport properties of multilayers. In the anisotropy energy work the effects of interfacial strain and morphology were the focus. The dynamics effort has recently provided a model for slow dynamic systems. The transport effort utilized multilayers of magnetic and nonmagnetic metals to study the interfacial scattering. The combination of a magnetic and nonmagnetic metal in this work facilitates the origin of the scattering by use of the anisotropic magnetoresistance.

DESCRIPTORS: (U) *THIN FILMS, *MAGNETIC MATERIALS, MANUFACTURING, EPITAXIAL GROWTH, METAL FILMS, IRON, ELECTRON TRANSPORT, MAGNETOOPTICS.

IDENTIFIERS: (U) Vacuum sputtering, Spin orbit coupling, WJAFOSR2306C1, PE61102F.

AD-A250 402

UNCLASSIFIED

ABSTRACT: (U) This report summarizes the major research accomplishments performed under AFOSR Grant 88-0231, HUMAN IMAGE UNDERSTANDING. An extensive series of experiments assessing the visual priming of briefly presented images indicate that the visual representation that mediates real time object recognition specifies neither the image edges or vertices nor an overall model of the object but an arrangement of simple volumes (or geons) corresponding to the object's parts. This representation can be activated with no loss in efficiency when the image is projected onto the retina at another position, size, or orientation in depth from when originally viewed. Consideration of these invariances suggests a computational basis for the evolution of two extrastriate visual systems, one for recognition and the other subserving motor interaction. It may be possible to assess the functioning of these systems behaviorally, that is, to split the cortex horizontally, through a comparison of performance on naming and episodic memory tasks. We have developed a neural network model (Hummel and Biederman, 1992) that captures the essential characteristics of human object recognition performance.

DESCRIPTORS: (U) IMAGES, VISUAL PERCEPTION, RECOGNITION, MEMORY (PSYCHOLOGY), RETINA.

IDENTIFIERS: (U) *Representation, *Neural network model,

AD-A250 401

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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*Object recognition, WUAFOSR2313A5, PE61102F.

NORTHWESTERN UNIV EVANSTON IL COLL OF ARTS AND SCIENCES
(U) Phosphoprotein Regulation of Behavioral Reactivity.

DESCRIPTIVE NOTE: Annual technical rept. 1 Mar 91-29 Feb 92,

APR 92 8P

PERSONAL AUTHORS: Routtenberg, Aryeh

CONTRACT NO. AFOSR-90-0240

PROJECT NO. 2312

TASK NO. A2

MONITOR: AFOSR, XF
TR-92-0409, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The effects of protein kinase C activators and inhibitors on two behavioral models that probe memory functions have been studied: imprinting in the one day old chick and radial arm maze performance in the adult albino rat. The main conclusion to be drawn is that PKC is necessary but not sufficient for the enhanced durability of memory. In combination with a neural signal, however, PKC demonstrates a profound synergism. This signal can be modulated by a glial-derived factors. S-100. Our most recent behavioral studies have involved the effects of novelty stress and food deprivation stress on yet another role of PKC: regulation of transcription factor function. These studies and the initial results suggest that stress can impact on gene regulation.

DESCRIPTORS: (U) *PHOSPHOPROTEINS, *MEMORY(PSYCHOLOGY), INHIBITORS, SYNERGISM, SYNAPSE.

IDENTIFIERS: (U) WUAFOSR2312A2, PE61102F, *Protein kinase C, Activators, Transcription factor, *Behavioral models, Synaptic activity.

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AD-A250 399 9/1 20/12

AD-A250 364 7/3

ILLINOIS UNIV AT URBANA COORDINATED SCIENCE LAB

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

(U) III-V Heterojunction Structures and High Speed Devices.

(U) Photoproduction of Remarkably Stable Benzylic Radicals
in Cyclohexanone Inclusion Complexes.

DESCRIPTIVE NOTE: Final rept. 1 Jan 89-31 Dec 91.

91 6P

MAR 92 43P

PERSONAL AUTHORS: Rao, V. P.; Zimmt, Matthew B.; Turro,
Nicholas J.

CONTRACT NO. AFOSR-89-0239

CONTRACT NO. AFOSR-91-0340

PROJECT NO. 2305

PROJECT NO. 2303

TASK NO. BS

TASK NO. B2

MONITOR: AFOSR, XF
TR-92-0274, AFOSRMONITOR: AFOSR, XF
TR-92-0377, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Growth conditions have been established for GaAs, InGaAs, InP and InGap using the newly installed Gas Source Molecular Beam Epitaxy apparatus. A study was conducted on the pseudomorphic epitaxy of Si on GaAs. MIS structures were pursued through various SiN (x) and SiGe (x) interlayers. (Author)

Availability: Pub. in Jnl. Photochem. Photobiol. A Chem., v60 p355-360, 1991. Available to DTIC users only. No copies furnished by NTIS.

Reprint: Photoproduction of Remarkably Stable Benzylic Radicals in Cyclohexanone Inclusion Complexes.

DESCRIPTORS: (U) *GROUP III COMPOUNDS, *GROUP IV COMPOUNDS, *HETEROJUNCTIONS, TRANSISTORS, INDIUM, GALLIUM ARSENIDES, RATES.

DESCRIPTORS: (U) *BENZYL RADICALS, *PHOTOCHEMICAL REACTIONS, *SOLID STATE CHEMISTRY, PHOTOLYSIS, EMISSION SPECTRA, COMPLEX COMPOUNDS, ELECTRON SPIN RESONANCE, EXCITATION, REPRINTS.

IDENTIFIERS: (U) WUAFOSR2305BS, PE61102F, Air Force report, Multimedia document.

IDENTIFIERS: (U) PE61102F, WUAFOSR230382, *Cyclohexanone, Keton/dimethyldibenzyl.

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COLORADO UNIV AT BOULDER DEPT OF CHEMISTRY AND
BIOCHEMISTRY

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B1,
Photodissociation, Photofragments, Laser ion beams.

(U) Triplet State Spectroscopy and Photofragment Dynamics
of $N_2^+ 2$.

MAR 92 14P

PERSONAL AUTHORS: Mullin, Amy S.; Szaflarski, Diane M.;
Gerber, Kazushige Y.; Lineberger, W. C.

CONTRACT NO. AFOSR-89-0074

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR, XF
TR-92-0378, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Chemistry Physics, v96 n5
p3636-3648, 1 Mar 92. Available to DTIC users only. No
copies furnished by NTIS.

ABSTRACT: (U) Doubly charged diatomic ions in low-lying
electronic states are unique metastable species with
unusual bonding and dissociation properties. While
Coulomb repulsion is the dominant force between two
positively charged atomic ions at large internuclear
distances, attractive chemical forces can be present at
close range, resulting in diatomic dications which are
bound in metastable potential wells. Dications exhibit a
wide range of lifetimes against predissociation,
depending on the position of the vibrational-rotational
level with respect to the barrier height. In vibrational -
rotational levels near the top of the Coulomb barrier,
dissociation by tunneling becomes rapid with a large
kinetic energy release. Because of their unexpected
stability and unusual dissociation dynamics, the
quasibound states of dications are particularly
interesting for both experimentalists and theorists.

DESCRIPTORS: (U) *SPECTROSCOPY, *DIATOMIC MOLECULES,
ELECTRONIC STATES, DISSOCIATION, METASTABLE STATE,
REPRINTS.

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COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

(U) Influence of Binding Strength of Added Electrolytes on the Properties of Micelles and of Micellized Radical Pairs.

92

7P

PERSONAL AUTHORS: Lei, Xue-Gong; Zhao, Guo-Hua; Liu, You-Chen

CONTRACT NO. AFOSR-91-0340

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR, XF
TR-92-0379, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Langmuir, v8 n2 p475-480, 1992.
Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) P-Methyldibenzyl ketone, pyrene, and 1,3-di-alpha-naphthylpropane have been employed as probes of the effects of added electrolytes on the properties of micelles and of the effects of an applied magnetic field on the reactivity of micellized radical pairs. The effect of added electrolytes depends on the structure of the surfactant head group, the length of the hydrocarbon chain of surfactants, the added gegenions, and the temperature. The electrolytes added were found to exhibit both a 'salt effect' on the physical properties of micelles, which is related to the strength of their binding to the micellar surface, and a 'magnetic effect' which is related to the ability of a bound cation to relax the triplet state of a micellized radical pair and thereby modify the reactivity of the pair. In aqueous solutions of anionic surfactants, Gd3+ causes a large magnetic field dependent internal magnetic field effect in addition to a salt effect on micellar properties. The internal magnetic field effect is independent of the length of hydrocarbon chain, but is dependent on the surface density of bound Gd3+ ions. The salt effect on micellar properties decreases with the increase of the length of hydrocarbon chain of the surfactants and with

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the surface density of added ions. Micelles: electrolytes; radical pairs; magnetic field effect.

DESCRIPTORS: (U) *ELECTROLYTES, *MAGNETIC FIELDS, ADDITION, BROMIDES, CATIONS, CHAINS, DENSITY, DIES, HEAD(ANATOMY), HYDROCARBONS, INTERNAL, IONS, LENGTH, NEUTRAL, NUMBERS, PHYSICAL PROPERTIES, PROBES, RARE EARTH ELEMENTS, REACTIVITIES, SALTS, SODIUM, STRUCTURES, SURFACE ACTIVE SUBSTANCES, SURFACES, TEMPERATURE, COLLOIDS, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR230382, *Micelles, *Radical pairs, *Binding strength.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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OKLAHOMA STATE UNIV STILLWATER DEPT OF CHEMISTRY

(U) Phenomenological and Monte Carlo Models for Diffusion-Controlled Bimolecular Reactions in Matrices.

92

8P

PERSONAL AUTHORS: Spath, Bruce W.; Raff, Lionel M.

CONTRACT NO. AFOSR-89-0085, F49620-92-J-0011

PROJECT NO. 2303

TASK NO. FS

MONITOR: AFOSR, XF
TR-92-0380, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Physical Chemistry, v96 n5 p2179-2185, 1992. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) Phenomenological and Monte Carlo models are developed to examine the kinetics of diffusion-controlled bimolecular reactions occurring in solid matrices. The models are based upon the hypothesis that the unusual kinetic behavior that is frequently observed for such systems is the result of inhomogeneity in the matrix environment that leads to a natural partitioning of the matrix into different zones, each of which is associated with its own characteristic diffusion coefficient or distribution of diffusion coefficients. By consideration of limiting cases of the N-zone, phenomenological model under pseudo-first order conditions, it is shown that first-order exponential kinetics will result whenever (1) the matrix environment becomes homogeneous, (2) the distribution of diffusion coefficients approaches a delta function, or (3) the diffusion rates become fast relative to the reaction rate. For fast, diffusion-controlled reactions, other limiting cases show that the presence of a distribution of diffusion coefficients leads to nonexponential kinetics. It is also shown that the expansion coefficients in a power series representation of the time dependence of the log of the reactant concentration (In AT) are related in a simple manner to the various number-weighted moments of

the diffusion coefficient distribution. Diffusion Rates, Matrices, Monte Carlo and Phenomenologic Models.

DESCRIPTORS: (U) *DIFFUSION, *REACTION KINETICS, APPROACH, BEHAVIOR, COEFFICIENTS, DELTAS, DIFFUSION COEFFICIENT, DISTRIBUTION, ENVIRONMENTS, EXPANSION, FUNCTIONS, KINETICS, MODELS, MOMENTS, NUMBERS, POWER, POWER SERIES, RATES, RECOMBINATION REACTIONS, REGIONS, SOLIDS, TIME, TIME DEPENDENCE, MONTE CARLO METHOD, MATHEMATICAL MODELS, MATRIX MATERIALS, VAPOR PHASES, REPRINTS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303FS, Bimolecular reactions.

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COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

PITTSBURGH UNIV PA DEPT OF CHEMISTRY

(U) Radical Scavenging in Zeolite Media.

(U) Electron Stimulated Desorption and Other Methods for the Study of Surface Phenomena Related to Atomic Level Aspects of Heterogeneous Catalysis.

92 3P

PERSONAL AUTHORS: Garcia-Garibay, M. A.; Lei, X. G.; Turro, N. J.

91 13P

PERSONAL AUTHORS: Yates, John T., Jr

CONTRACT NO. AFOSR-91-0340

CONTRACT NO. AFOSR-82-0133

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. B2

TASK NO. A2

MONITOR: AFOSR, XF
TR-92-0382, AFOSR

MONITOR: AFOSR, XF

TR-92-0381, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of the American Chemical Society, v114 n7 p2749-2750, 1992. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) The model of the solvent cage predicts that the dynamics of dissociating particles in fluid media depends on their probabilities of escape and recombination, and that there may be at least three potentially observable stages at which scavenging may occur: (a) primary geminate pairs; (b) secondary geminate pairs; (c) free radicals radical pairs; scavenging; geminate pairs; zeolites.

DESCRIPTORS: (U) *FREE RADICALS, *CATALYSTS, *RECOMBINATION REACTIONS, DYNAMICS, FLUIDS, MEDIA, MODELS, PARTICLES, SECONDARY, SOLVENTS, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR230382, Zeolites, Scavenging(Chemistry).

Availability: Pub. in Fundamental Aspects of Heterogeneous Catalysis Studied by Particle Beams, p237-248, 1991. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) Outlines of the contents of 3 lectures presented at a NATO workshop on catalysis are included. The lectures concern the use of modern physical methods for the study of molecular adsorbates on metal surfaces. Electron Stimulated Desorption ESDIAD, NH3, PF3, NO, CO, Ammonia, tri fluorophosphine, nitric oxide, carbon monoxide, defect, sited, Rh, Rhoium, catalysis, infrared.

DESCRIPTORS: (U) *CATALYSIS, *DESORPTION, *SURFACE CHEMISTRY, ADSORBATES, AMMONIA, BOOKS, CARBON, CARBON MONOXIDE, DOCUMENTS, ELECTRONS, ENVIRONMENTS, GRANTS, LECTURES, METALS, MITES, MONOXIDES, NATO, OXIDES, SURFACES, TELEOPERATORS, WORK, WORKSHOPS, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A2, Trifluorophosphine, Nitric oxide, Rhoium, *Transition metals, Metal surfaces, Catalyst systems, Crystal surfaces.

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WISCONSIN UNIV-MADISON DEPT OF CHEMISTRY

CARNEGIE-MELLON UNIV PITTSBURGH PA DEPT OF MATHEMATICS

(U) Photodimerization of 1-Phenyl-2-(trimethylsilyl)ethyne,

(U) Some Mathematical Problems in Continuum Mechanics.

91

5P

DESCRIPTIVE NOTE: Final technical rept. 30 Sep 88-29 Jun 91,

PERSONAL AUTHORS: Archibald, R. S.; Chinnery, Daniel P.; Fanta, Alan D.; West, Robert

JUL 91 7P

PERSONAL AUTHORS: Hrusa, William J.

CONTRACT NO. AFOSR-89-0004

PROJECT NO. 2303

REPORT NO. 1-52150

TASK NO. B2

CONTRACT NO. AFOSR-88-0265

MONITOR: AFOSR, XF

PROJECT NO. 2304

TR-92-0385, AFOSR

TASK NO. A4

UNCLASSIFIED REPORT

MONITOR: AFOSR, XF
TR-92-0351, AFOSR

Availability: Pub. in Organometallics, v10 n10 p3769-3772, 1991. Available to DTIC users only. No copies furnished by NTIS.

UNCLASSIFIED REPORT

ABSTRACT: (U) Room-temperature photolysis at 254 nm of 1-phenyl-2-(trimethylsilyl)ethylene (1) produces two cyclooctatetraenes, 2 and 3, for which structures 2a and 3a are suggested from 1 H NMR spectra. (Author)

ABSTRACT: (U) Research efforts were focused on problems in viscoelasticity, thermoelasticity and thermoviscoelasticity. Results were obtained concerning existence, stability and formation of singularities for classical solutions of various initial-boundary value problems. Some work was also performed on developing models of integral for thermoviscoelastic materials. Some Mathematical Problems in Continuum.

DESCRIPTORS: (U) *CYCLOOCTATETRAENE, *PHOTOLYSIS, *ABSORPTION, *LIGHT, *DIMERS, ISOMERS, ACETYLENE, REPRINTS, BENZENE, CHEMICAL REACTIONS, ORGANOMETALLIC COMPOUNDS, REPRINTS.

DESCRIPTORS: (U) *THERMOELASTICITY, *VISCOELASTICITY, *CONTINUUM MECHANICS, BOUNDARIES, BOUNDARY VALUE PROBLEMS, INTEGRALS, MATERIALS, MODELS, STABILITY.

IDENTIFIERS: (U) PEG1102F, WUAFOSR230382, *Photodimerization, *1-Phenyl-2-(Trimethylsilyl)ethyne, Intermolecular cycloadditions, Intramolecular annulations, Bicyclic, Arenes.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304A4, Initial value problems.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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AD-A250 350 CONTINUED

ARIZONA UNIV TUCSON

(U) An Experimental Investigation of the Formation of Secondary Vortices and the Generation of Small-Scale Motion in a Spanwise Forced Plane Mixing Layer.

DESCRIPTIVE NOTE: Final rept. 1 Aug 88-30 Sep 91.

MAR 92 177P

PERSONAL AUTHORS: Glezer, A.

CONTRACT NO. AFOSR-88-0271

PROJECT NO. 2307

TASK NO. BS

MONITOR: AFOSR, XF
TR-92-0361, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The evolution of spanwise instability modes and 3-D pulsed disturbances leading to the formation of streamwise vortices in a plane mixing layer and subsequently to the onset of small-scale 3-D motion were studied in a closed-return water facility. Streamwise vortices may result from a spanwise core instability of the primary vortices, or a spanwise instability of the nominally 2-D strain field between them. These two instability modes were excited by time-harmonic wavetrains with spanwise phase or amplitude variations, respectively, synthesized by a mosaic of surface film heaters flush-mounted on the flow partition. The appearance of the streamwise vortices is accompanied by significant distortion in the transverse distribution of the streamwise velocity component. Inflection points, which are not present in corresponding velocity distributions of the unforced flow, indicate the formation of locally unstable regions of large shear in which broadband perturbations already present in the base flow undergo rapid amplification which is followed by breakdown to turbulence and mixing transition. The core instability of the primary vortices suggests itself as a viable mechanism for the continuation of the mixing process far downstream of mixing transition. Pulsed excitation was produced by pulsed spanwise amplitude

modulation of a spanwise-uniform time-harmonic carrier wave train synthesized by the surface film heaters. Schlieren visualization showed that the disturbance spreads rapidly in the streamwise and lateral directions as it is advected downstream, and causes a substantial distortion of the adjacent spanwise vortices. shear layer, mixing, surface heaters, hot wire sensors, spanwise nonuniform, excitation, pulsed excitation, schlieren

DESCRIPTORS: (U) *TURBULENCE, *VORTICES, *MIXED LAYER(MARINE), *SHEAR PROPERTIES, AMPLIFICATION, AMPLITUDE MODULATION, AUGMENTATION, BASE FLOW, BROADBAND, CORES, DEMODULATION, DISTORTION, DISTRIBUTION, EXCITATION, FACILITIES, FILMS, FLOW, HARMONICS, HEATERS, INSTABILITY, LAYERS, MEASUREMENT, MIXING, MODULATION, MOTION, NONUNIFORM, PACKETS, PERTURBATIONS, PHASE, PROPAGATION, PULSES, REGIONS, SCALE, SURFACES, TIME, TRANSIENTS, TRANSITIONS, TRANSVERSE, UNIFORMS, VARIATIONS, VELOCITY, WATER, WAVE PACKETS, WATER TUNNELS, HOT WIRE ANEMOMETERS.

IDENTIFIERS: (U) WUAFOSR2307B, PEG1102F.

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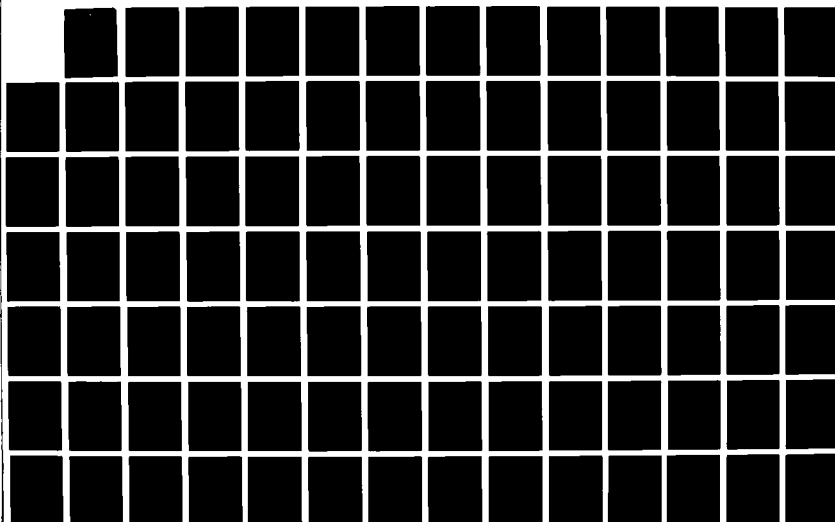
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REPORT SUMMARIES SECOND QUARTER 1992(U) AIR FORCE
OFFICE OF SCIENTIFIC RESEARCH BOLLING AFB DC
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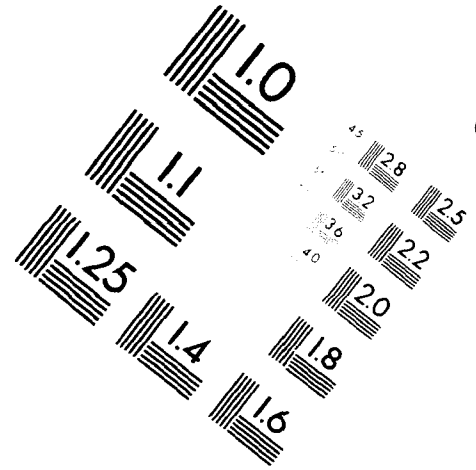
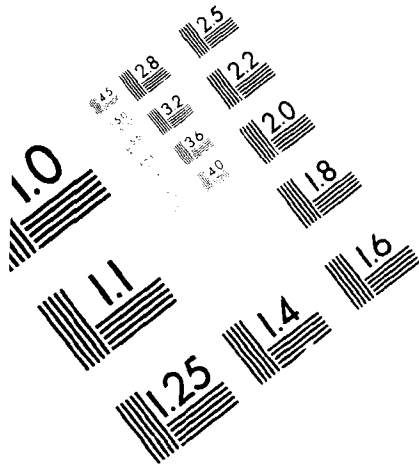




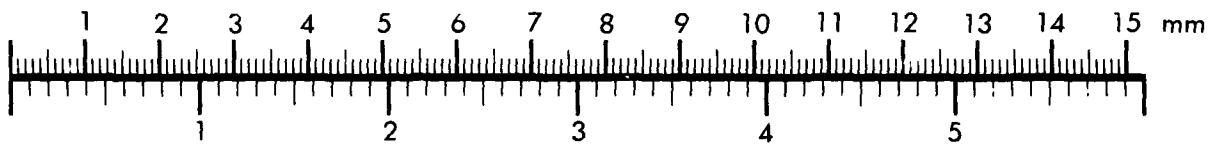
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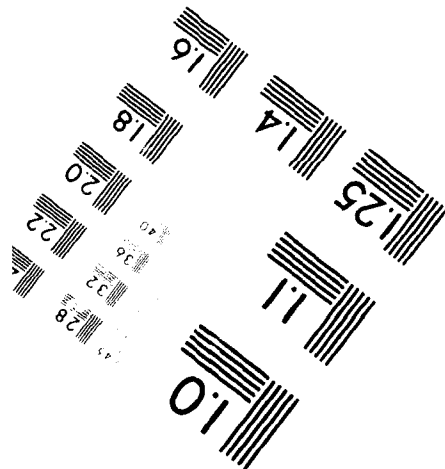
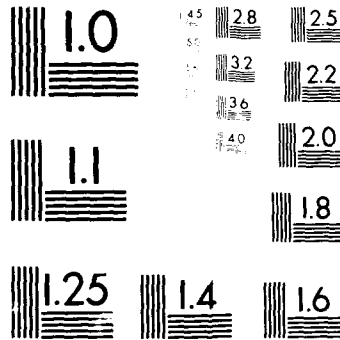
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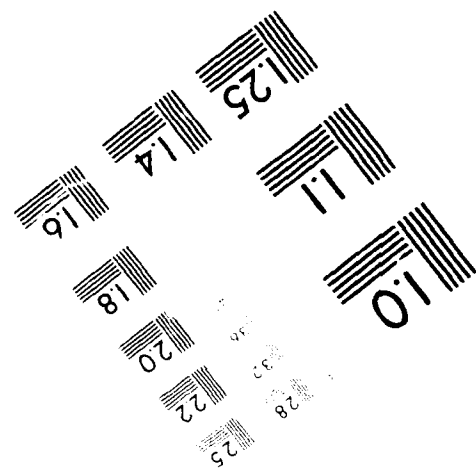
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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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SRI INTERNATIONAL MENLO PARK CA

(U) Microwave Interactions with Plasmas.

DESCRIPTIVE NOTE: Final rept. Jun 89-Jun 92,

APR 92 69P

PERSONAL AUTHORS: Eckstrom, D. J.; Vidmar, R. J.; Stalder, K. R.

CONTRACT NO. F49620-90-C-0041

PROJECT NO. 2301

TASK NO. A8

MONITOR: AFOSR, XF
TR-92-0343, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Microwave interactions with a cold, collisional plasma having gradual density gradients were studied. The plasma was created by the photoionization of tetrakisdimethylaminoethylene (TMAE) vapor seeded into atmospheric pressure helium. Photoionization was provided primarily by sparkboard spatial scans of the absorption of a microwave probe beam along chords across the plasma, with subsequent Abel inversion, yielded three-dimensional plasma density profiles that showed a gradual decrease in the peak plasma density versus distance away from the sparkboard. When a 58cm-diameter reflector was illuminated with 10-GHz microwaves in an anechoic chamber, the plasma sorbed as much as 28 dB in direct reflection, with similar attenuation of the normally weak side-scattered and cross-polarized radiation. The attenuation was compared with model predictions. Detailed analysis of the temporal and spatial dependence of the electron density following ionization that both recombination and attachment processes influenced the plasma decay. The recombination rate of TMAE was found to be $(9.0 \pm 1.1) \times 10^{(-6)} \text{ cm}^3 \text{ s}^{-1}$ for 300 K electrons. This work confirms the effectiveness of a cold, collisional plasma as a broadband, switchable wave absorber. Plasmas, Microwave-Plasma Interactions, Microwave Absorption, Afterglows.

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DESCRIPTORS: (U) *MICROWAVES, *PLASMAS(PHYSICS), AFTERGLOWS, ANECHOIC CHAMBERS, ATMOSPHERICS, ATTACHMENT, ATTENUATION, BAROMETRIC PRESSURE, BROADBAND, CHAMBERS, DECAY, DENSITY, DIAMETERS, ELECTRON DENSITY, ELECTRONS, GRADIENTS, HELIUM, INTERACTIONS, INVERSION, IONIZATION, MODELS, PHOTOIONIZATION, PREDICTIONS, PRESSURE, PROBES, PROFILES, RATES, REFLECTION, REFLECTORS, SPARKS, THREE DIMENSIONAL, VAPORS, RADIATION ABSORPTION.

IDENTIFIERS: (U) WUAFOSR2301A8, Collisionless plasmas.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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SCIENTIFIC RESEARCH ASSOCIATES INC GLASTONBURY CT

(U) Numerical Studies of Low Temperature Gallium Arsenide
Buffer Layers and Their Influence on Device Operation.

MATERIALS, ONE DIMENSIONAL, OPERATION, PAPER, STRUCTURES,
TEMPERATURE, TERMINALS, TRANSIENTS, TRANSPORT, TRAPS, TWO
DIMENSIONAL, WORK.

IDENTIFIERS: (U) WJAFOSR2305BS, PE61102F.

DESCRIPTIVE NOTE: Annual rept. 15 Feb 91-15 Feb 92,

APR 92 12P

PERSONAL AUTHORS: Grubin, H. L.; Kreskovsky, J. P.

REPORT NO. SRA-R92-910034-1

CONTRACT NO. F49620-91-C-0023

PROJECT NO. 2305

TASK NO. BS

MONITOR: AFOSR, XF
TR-92-0311, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This report summarizes recent work on the development and application of an algorithm for studying charge transport in low temperature gallium arsenide (LT GaAs) buffer layers and their influence on device operation. During this reporting period the drift and diffusion equations were modified to include the transient dependence of electrons and holes for gallium arsenide. Calculations were performed for two-terminal, one and two-dimensional structures. Studies with the one-dimensional structures focussed on the trap kinetics. The two-dimensional studies represent a first attempt to examine the effects of clusters on transport through the LT GaAs. The one-dimensional studies are very briefly summarized, as the results were presented at the recent MRS symposium on LT materials, and will appear in the conference proceedings. A copy of the paper accompanies this report. The newer clustering results are also included. We note that these latter results are very preliminary and are included to indicate the future direction of our LT studies. LT Material, Clusters, GaAs.

DESCRIPTORS: (U) *GALLIUM ARSENIDES, *LOW TEMPERATURE,
ALGORITHMS, ARSENIDES, BUFFERS, CLUSTERING, DIFFUSION,
DRIFT, ELECTRONS, EQUATIONS, GALLIUM, KINETICS, LAYERS,

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ARIZONA UNIV TUCSON

FUNCTIONS, HYDROCARBONS, IDENTITIES, LIVER, LUNG, MICE, PERMEABILITY, PULMONARY FUNCTION, RATS, SECONDARY, SENSITIVITY, WOUNDS AND INJURIES.

(U) The Chronic Effects of JP-8 Jet Fuel Exposure on the Lungs.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2312A5.

LSCRIPTIVE NOTE: Annual rept. 1 Apr 91-1 Apr 92.

APR 92 17P

PERSONAL AUTHORS: Witten, Mark L.

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR, XF
TR-92-0314, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This research has resulted in four separate projects. The first was the exposure of Fischer 344 rats to JP-8 jet fuel for 7 or 28 days. This exposure resulted in changes in pulmonary function and lung chemical mediators. Specifically Substance P, after 28 days of exposure. The second project dealt with blocking the increase in SP in these rats by a pretreatment regimen with capsaicin before jet fuel exposure. Capsaicin caused a further increase in lung permeability and a million-fold increase in airway sensitivity to histamine after the 7-day jet fuel exposure. The third project dealt with the effects of a 7-day jet fuel exposure in congenic mice who are deficient in the inducibility of the aryl hydrocarbon hydroxylase enzyme. These mice are relatively resistant to the effects of jet fuel-induced lung injury. The fourth project investigated the effects of the jet fuel exposure on secondary organs, specifically the liver, spleen, and kidneys. There were pathological differences in the liver, spleen, and kidneys between the 7-day jet fuel exposure group and baseline controls. However, some of these differences were not apparent in the 28-day exposure group, possibly indicating compensatory mechanisms to the exposure. JP-8 Jet Fuel Exposure and its effects on the lungs and other organs.

DESCRIPTORS: (U) *HISTAMINE, *JET ENGINE FUELS, *KIDNEYS, *SPLEEN, BLOCKING, CHEMICALS, DAY, ENZYMES, FUELS,

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UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES SCHOOL OF
ENGINEERING

WISCONSIN UNIV-MADISON SCHOOL OF PHARMACY

(U) Center for the Integration of Optical Computing.

(U) Perfluorodecanoic Acid and Lipid Metabolism in the Rat.

DESCRIPTIVE NOTE: Annual rept. no. 2, 15 Feb 91-14 Feb 92.

88 9P

MAR 92 59P

PERSONAL AUTHORS: Sawchuk, A. A.; Steier, W. H.

PERSONAL AUTHORS: Van Rafelghem, Marc J.; Vanden Heuvel,
John P.; Menahan, Lawrence A.; Peterson, Richard E.

CONTRACT NO. AFOSR-90-0133

CONTRACT NO. AFOSR-85-0207

PROJECT NO. 3483

PROJECT NO. 2312

TASK NO. A3

TASK NO. A5

MONITOR: AFOSR, XF
TR-92-0279, AFOSRMONITOR: AFOSR, XF
TR-91-0297, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Topics reviewed include: Optical connections, lenslet array processors, generalization neural networks, spatial light modulators, MBE growth of quantum well structures, ultralow threshold laser array, charge transport optical nonlinearities, wave mixing at the bandedge in III-V semiconductors and photorefractive optical interconnections Optical computing, laser arrays, spatial modulators, optical interconnections, optical neural interconnections.

DESCRIPTORS: (U) *OPTICAL PROCESSING, ARRAYS, LASERS, LIGHT, LIGHT MODULATORS, MIXING, MODULATORS, NETWORKS, SEMICONDUCTORS, STRUCTURES, TRANSPORT, COMPUTATIONS, NEURAL NETS, ELECTRICAL ENGINEERING.

IDENTIFIERS: (U) WUAFOSR3484A2, PE61103D.

Availability: Pub in Lipids, v23 n7 p671-678 1988.
Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) Derivatives of perfluorosulfonic and perfluorocarboxylic acids have been used in a number of industrial applications as lubricants, plasticizers, wetting agents and corrosion inhibitors. Aqueous film-forming foams, used as fire extinguishants, contain mixtures of hydrocarbon and fluorocarbon surfactants (derivatized fatty acids) due to their superior surface-active properties. Perfluorodecanoic acid (PFDA), representative of these perfluorinated fatty acids, results in a progressive reduction in feed intake, body weight loss, along with an increase in liver mass and changes in hepatic lipid composition in the rat. These effects followed treatment with a single intraperitoneal dose of PFDA. Recently, PFDA-treated rats were found to either gain less or lose more weight (depending on the dose administered) than vehicle-treated rats with the same caloric intake.

DESCRIPTORS: (U) *LIPID METABOLISM, LIVER DISEASES, INJECTIONS(MEDICINE), BILIARY SYSTEM, DEOXYRIBONUCLEIC ACIDS, REPRINTS.

IDENTIFIERS: (U) Perfluorodecanoic acid, Carcass lipids, WUAFOSR2312A5, PE61102F.

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FLORIDA UNIV GAINESVILLE DEPT OF CHEMISTRY

(U) Recursive Intermediate Factorization and Complete Computational Linearization of the Coupled-Cluster Single, Double, Triple, and Quadruple Excitation Equations.

91

20P

PERSONAL AUTHORS: Kucharski, Stanislaw A.; Bartlett, Rodney J.

CONTRACT NO. AFOSR-90-0079

PROJECT NO. 2301

TASK NO. DS

MONITOR: AFOSR, XF
TR-92-0297, AFOSR

UNCLASSIFIED REPORT

Availability: Pub in Theor Chim Acta v80 p387-405 1991.
Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) The nonlinear CCSDTQ equations are written in a fully linearized form, via the introduction of computationally convenient intermediates. An efficient formulation of the coupled cluster method is proposed. Due to a recursive method for the calculation of intermediates, all computational steps involve the multiplication of an intermediate with a TAU vertex. This property makes it possible to express the CC equations exclusively in terms of matrix products which can be directly transformed into a highly vectorized program.

DESCRIPTORS: (U) *LINEAR ALGEBRAIC EQUATIONS, *RECURSIVE FUNCTIONS, *EXCITATION, CLUSTERING, MATRICES(MATHEMATICS), REPRINTS.

IDENTIFIERS: (U) WUAFOSR2301DS.

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AEROCHEM RESEARCH LABS INC PRINCETON NJ

(U) Modeling Study to Evaluate the Ionic Mechanism of Soot Formation.

DESCRIPTIVE NOTE: Annual rept. 15 Dec 90-14 Dec 91,

APR 92

37P

PERSONAL AUTHORS: Calcote, H. F.; Gill, R. J.; Berman, C. H.

REPORT NO. AEROCHEM-TP-508

CONTRACT NO. F49620-91-C-0021

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR, XF
TR-92-0373, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) It has been demonstrated that in a sooting laboratory flame the time to add a carbon atom to a growing carbon species is about the same, or shorter, for the ionic than for the free radical mechanism. The calculated step time is consistent with the experimentally observed time in the flame to build a soot particle. It has also been demonstrated that, up to about 30 carbon atoms, the thermodynamic driving force for the ionic mechanism is much greater than for the neutral mechanism; above 30 carbon atoms they are equal. The Langevin theory of ion-molecule reactions has been modified to accommodate large ions. The results indicate a greater collision coefficient for large ions than calculated by Langevin. The coefficient for a hard sphere collision decreases as ion diameter increases up to about 3 nm diam for a conducting spherical ion, and about 1 nm for a nonconducting spherical ion. The Sandia Flame Code has been modified to: (1) accept individual experimental concentration profiles as input; (2) use non-Arrhenius rate constants; and (3) accept ambipolar diffusion coefficients. Analysis of our previous modeling of the ionic mechanism and many runs with the modified code indicate either a basic flaw in the mechanism or

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modeling problem. The detailed modeling results are inconsistent with the calculated speed with which carbon atoms are added and with the strong thermodynamic driving force for the ionic mechanism. Soot Formation; Ionic Mechanism; Thermodynamics; Ion-Molecule Reactions; Computer Modeling.

DESCRIPTORS: (U) *CARBON, *FLAMES, *IONS, *SOOT, *ION MOLECULE INTERACTIONS, ATOMS, COEFFICIENTS, COLLISIONS, COMPUTERS, CONSTANTS, DIAMETERS, DIFFUSION, FREE RADICALS, LABORATORIES, MOLECULES, NEUTRAL, PARTICLES, PROFILES, RATES, SPHERES, THEORY, THERMODYNAMICS, TIME, VELOCITY, COMBUSTION, BENZENE, OXYGEN.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A2.

OREGON STATE UNIV NEWPORT HATFIELD MARINE SCIENCE CENTER

(U) Parallel Processing and Learning: Variability and Chaos in Self-Organization of Activity in Groups of Neurons.

DESCRIPTIVE NOTE: Final rept. 15 Jan 89-14 Jan 92.

APR 92 3P

PERSONAL AUTHORS: Mpltsos, George J.

CONTRACT NO. AFOSR-89-0262, F49620-89-C-0262

PROJECT NO. 2312

TASK NO. A1

MONITOR: AFOSR, XF
TR-92-0301, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Simulations: Processing of chaos and memory storage. In view of our previously published findings showing that motor patterns represent adaptive behaviors may be generated by chaotic activity, we have used computer simulations to examine the ability of simple networks to learn to process chaotic signals and to perform complex operations on them. These studies have shown that even simple networks can be used to understand how networks store information, much of which information can not have been obtained from the more complex biological systems. As one example, an important and unexpected finding is that networks having trainable thresholds, in addition to trainable synapses, can performs computations that trainable synapses alone can not, regardless of the number synapses that may be included in the network. Another finding is that when networks must learn several tasks simultaneously, the effective size network is self-limiting, and probably does not require special algorithmic rules for limiting the size of successfully computing neural connections.

DESCRIPTORS: (U) *PARALLEL PROCESSING, *LEARNING, CHAOS, COMPUTERIZED SIMULATION, NETWORKS, MEMORY(PSYCHOLOGY).

IDENTIFIERS: (U) PE61102F, WUAFOSR2312A1, TINA(Time

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Invariant Noise Algorithm).

AD-A250 289 7/4 20/13 7/3 20/2

WISCONSIN UNIV-MADISON DEPT OF CHEMISTRY

(U) Asterane-Like Compounds from 2,2,4,4-Tetraamethyl-1,3-diphospho-2,4-disilabicyclo-(1.1.0)butane,

91 4P

PERSONAL AUTHORS: Fanta, Alan D.; Driess, Matthias; Powell, Douglas R.; West, Robert

CONTRACT NO. AFOSR-89-0004

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR, XF
TR-92-0384, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of the American Chemical Society, V113 n20 p7806-7808, 1991. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) The title compound 1 reacts with (1) (PPh₃)₂PtCl₂H₄ (2) elemental Se; or (3) undergoes thermolysis to give tricyclo[1.1.1]pentane (asterane) molecules, 2a, 4 and 3, as shown in Scheme 1. The x-ray crystal structure of 2a was determined.

DESCRIPTORS: (U) *CRYSTAL STRUCTURE, *BUTANES, *SELENIUM, *PENTANES, *DECOMPOSITION, *HEAT, CRYSTALS, MOLECULES, STRUCTURES, X RAYS, REPRINTS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR230382, *Asterane like compounds, *Thermolysis.

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MASSACHUSETTS INST OF TECH CAMBRIDGE RESEARCH LAB OF ELECTRONICS

GEORGIA INST OF TECH ATLANTA SCHOOL OF CHEMICAL ENGINEERING

(U) Super Auditory Localization for Improved Human-Machine Interfaces.

(U) Fundamental Study of Compressive Strength Development in PAN-Based Carbon Fibers.

DESCRIPTIVE NOTE: Final rept. 1 Jun 90-28 Feb 92,

DESCRIPTIVE NOTE: Final technical rept. Dec 88-Sep 91,

APR 92 5P

MAR 92 82P

PERSONAL AUTHORS: Durlach, Nathaniel

PERSONAL AUTHORS: Abhiraman, A. S.

CONTRACT NO. AFOSR-90-0312

CONTRACT NO. AFOSR-89-0193

PROJECT NO. 2313

PROJECT NO. 2419

TASK NO. A9

TASK NO. 00

MONITOR: AFOSR. XF
TR-92-0392, AFOSRMONITOR: AFOSR. XF
TR-92-0302, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Work by Dr. Durlach and his collaborators is summarized here. The creation of a serious journal for continuing publication for peer-reviewed papers seemed essential for development of the field (both technically and academically.) Thus, the funds in the grant were used to support the creation of a journal rather than a book. The journal is 'presence: teleoperators and virtual environments,' published by MIT Press. The work performed to start the journal has occurred in two phases. The first consisted of establishing the journal as an organization entity. The second, which has only been completed within the past month, consisted of generating the first issue.

DESCRIPTORS: (U) *HUMAN FACTORS ENGINEERING, *SCIENTIFIC LITERATURE, BOOKS, DOCUMENTS, ENVIRONMENTS, GRANTS, TELEOPERATORS, WORK, MAN MACHINE SYSTEMS, MAN COMPUTER INTERFACE, PERIODICALS.

IDENTIFIERS: (U) WUAFOSR2313A9, Journals.

ABSTRACT: (U) Evolution of mechanical properties in the conversion of two precursor polymeric fibers to carbon fibers has been studied. The focus has been on properties in axial compression of polyacrylonitrile (PAN, a semi rigid polymer) - and polybenzobisthiazole (PBZT, a rigid rod polymer) - based carbon fibers. Mechanical properties of fibers at different extents of progression toward the graphite fiber structure reveal that the evolutions of tensile and compressive properties are not synchronized. Substantial enhancements in both tensile and compressive strengths of carbon fibers occur only with the development of the carbonized morphology with its characteristic basal planes as the fundamental structural units. In addition, the recoil from tension method has been analyzed vis-a-vis axial compressive strength of carbon fibers. Fracture surfaces of specimens from this experiment do not necessarily reveal failure in a simple compression mode and especially includes bending. Statistical analysis of the recoil method demonstrates that the fiber failure distribution can be expressed by either a logistic or a Weibull distribution. Carbon Fiber Formation, Recoil Strength, Compressive Strength PBZT Fibers, PAN Fibers, Mechanical Properties of Carbon Fibers, Recoil Fracture Analysis

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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DESCRIPTORS: (U) *CARBON FIBERS, *POLYMERS, *STRENGTH(MECHANICS), *ADDITION, BENDING, CARBON, COMPRESSION, COMPRESSIVE PROPERTIES, CONVERSION, DISTRIBUTION, FAILURE, FIBERS, GRAPHITE, LOGISTICS, MECHANICAL PROPERTIES, MORPHOLOGY, PRECURSORS, RECOIL, RODS, STRUCTURES, SURFACES, TENSILE PROPERTIES, TENSILE STRENGTH, FRACTURE(MECHANICS), COMPOSITE MATERIALS, FIBER REINFORCED COMPOSITES.

IDENTIFIERS: (U) PE61102F, WUAFOSR241900, LPN-GIT-E-19-642-4, *Compressive strength, *Polybenzobisthiazole, Polyacrylonitrile, Carbonization.

CALSPAN UB RESEARCH CENTER BUFFALO NY

(U) Fundamental Studies of the Structure of Hypersonic Attached and Separated Boundary Layers Over Smooth, Rough and Transpiration-Cooled Surfaces.

DESCRIPTIVE NOTE: Final technical rept. 15 May 88-29 Aug 91,

NOV 91 198P

PERSONAL AUTHORS: Holden, Michael S.

CONTRACT NO. AFOSR-88-0223

PROJECT NO. 2307

TASK NO. AS

MONITOR: AFOSR, XF
TR-92-0394, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) A program of fundamental experimental research and analysis has been conducted to examine two key areas associated with the design of hypersonic vehicles for re-entry and sustained hypervelocity flight. In the first, and major segment of the program, detailed measurements were obtained to examine the thermo-fluid dynamics of transpiration-cooling and the separate and combined effects of surface roughness and blowing on the fluid mechanics of transpiration and ablative thermal protection systems. In the second segment of the program, we embarked in a detailed experimental examination of turbulent compressibility effects in regions of attached and separated flows. The first phase of this program was devoted to studies associated with developing the models and instrumentation to obtain highly resolved high frequency measurements in fully turbulent boundary layer at Mach 11, 13, and 15. While in the second phase of this program, segments were concentrated on the development of the direct measurement of density fluctuations using high pressure electron beam techniques. During this contract we also took the opportunity to analyze and publish important measurements made in an earlier program demonstrating compressibility effects in hypersonic turbulent wakes. Experimental Research, Hypersonic

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AD-A250 283 20/8 12/3

Vehicles, Attached, Separated, Transpiration Cooling, Surface Roughness and Blowing, Ablative Thermal Protection Systems, Compressibility Effects, Head Transfer, Skin Friction Electron Beam Technique, Density Measurements.

ARIZONA STATE UNIV TEMPE DEPT OF MECHANICAL AND AEROSPACE ENGINEERING

(U) Particle Sizing Errors Associated with the Fraunhofer Diffraction Assumption in the Anomalous Diffraction Regime.

DESCRIPTORS: (U) *SKIN FRICTION, *SWEAT COOLING, *TRANSPIRATION, *FILM COOLING, *BOUNDARY LAYER CONTROL, BOUNDARIES, BOUNDARY LAYER, COMPRESSIVE PROPERTIES, COOLING, DENSITY, DYNAMICS, ELECTRON BEAMS, FLIGHT, FLUID DYNAMICS, FLUID MECHANICS, FLUIDS, FRICTION, HEAD(ANATOMY), HIGH FREQUENCY, HIGH PRESSURE, HYPERSONIC VEHICLES, INSTRUMENTATION, LAYERS, MEASUREMENT, MECHANICS, MODELS, PHASE, PROTECTION, REGIONS, ROUGHNESS, SURFACE ROUGHNESS, SURFACES, TRANSFER, VEHICLES, WAKE, FLOW SEPARATION, HEAD(FLUID MECHANICS).

MAY 90 6P

PERSONAL AUTHORS: Kenney, S. B.; Hirleman, E. D.

CONTRACT NO. AFOSR-84-0187

PROJECT NO. 2308

TASK NO. A3

IDENTIFIERS: (U) PE61102F, WUAFOSR2307AS, Hypersonic boundary layer, Head transfer.

MONITOR: AFOSR, XF
TR-91-0352, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Proceedings of ILASS Americas Conference 90, p1-5, May 21-23, 1990.

ABSTRACT: (U) The optical measurement technique commonly known as the Fraunhofer diffraction particle sizing method involves measuring the near forward scattering signature of an ensemble of large particles followed by a mathematical inversion procedure to determine the particle size distribution function. Of interest in this paper are errors introduced by a lack of knowledge of the particle relative refractive index. The near-forward scattering signature of an ensemble of particles will change as the refractive index of the particles approaches that of the surrounding medium. Under these conditions the refracted light is increasingly directed into near-forward angles, interfering with the diffracted light, and thereby altering the near-forward scattering pattern. A particle sizing instrument based entirely on Fraunhofer diffraction formulas will give erroneous results when the refractive index of the particles is similar to that of the surrounding medium. Quantitative predictions of the effect of unknown refractive indices on the measured size distributions are reported. Particle Sizing, Droplet Sizing, Sprays, Light Scattering, Multiple Scattering, optical diagnostics, optical sensors.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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AD-A250 282 11/6 20/11 20/2 20/12

DESCRIPTORS: (U) *DISTRIBUTION FUNCTIONS, *PARTICLE SIZE, ANGLES, APPROACH, DIFFRACTION, DISTRIBUTION, ERRORS, FORWARD SCATTERING, FUNCTIONS, INDEXES, INVERSION, LIGHT SCATTERING, MEASUREMENT, PAPER, PARTICLES, PATTERNS, PREDICTIONS, REFRACTIVE INDEX, SCATTERING, SIGNATURES, SPRAYS, REPRINTS.

CALIFORNIA UNIV DAVIS DIV OF MATERIALS SCIENCE AND ENGINEERING

(U) Strengthening Mechanisms, Creep and Fatigue Processes in Dispersion Hardened Niobium Alloy.

DESCRIPTIVE NOTE: Final scientific rept. 1 Feb 89-31 Jan 92.

APR 92 57P

PERSONAL AUTHORS: Mukherjee, Amiya K.; Gibeling, Jeffery C.

CONTRACT NO. AFOSR-89-0287

PROJECT NO. 2306

TASK NO. AS

MONITOR: AFOSR, XF
TR-92-0387, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The creep and fatigue properties of pure Nb and Nb-1%Zr alloy were investigated. A model was developed based on the migration of subgrain boundary that can explain the anomalous primary creep transients found in Nb-1%Zr alloy, due to coarsening of subgrain structure. TEM investigations confirmed that such subgrain coarsening occurs during primary creep of Nb-1%Zr. Baseline low cycle fatigue studies of Nb and Nb-1%Zr were completed. Cyclic hardening is observed and there is a microplastic plateau in Nb. The Nb1%Zr is stronger in cyclic deformation than Nb, with little influence of strain rate. The deformation in the alloy at both high and low strain rates is controlled by the interaction between gliding edge dislocation and solute atoms. Creep, fatigue, niobium alloy, dislocation mechanisms.

DESCRIPTORS: (U) *ALLOYS, *CREEP, *DISLOCATIONS, *FATIGUE, *HARDENING, *NIOBIUM ALLOYS, *REFRACTORY METAL ALLOYS, *DISPERSIONS, *ZIRCONIUM ALLOYS, ATOMS, BOUNDARIES, CYCLES, DEFORMATION, EDGES, GLIDING, INTERACTIONS, MIGRATION, MODELS, NIOBIUM, PLATEAUS, RATES, SOLUTES, STRAIN RATE, STRUCTURES, TRANSIENTS, GRAIN

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BOUNDARIES, STRESSES, METALS.

CALIFORNIA UNIV BERKELEY DEPT OF PSYCHOLOGY

IDENTIFIERS: (U) PE61102F, WUAFOSR2306AS, Subgrain boundaries, Coarsening, Microplastic plateaus.

(U) Norms and the Perception of Events.

DESCRIPTIVE NOTE: Final rept. 1 May 88-31 Jan 92.

JAN 92 40P

PERSONAL AUTHORS: Kahneman, Daniel

CONTRACT NO. AFOSR-88-0206

PROJECT NO. 6912

TASK NO. OR

MONITOR: AFOSR, XF
TR-92-0393, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The research was described in detail in preceding technical reports. This final report draws extensively on earlier ones', but it is somewhat selective, focusing on the more important and/or successful themes of the research. The report is organized as follows: (1) Studies of normality. (2) Further studies of contingent coding. (3) Processing of dimensional information in priming. (4) The language of counterfactuals. (5) Comparisons of intrapersonal and interpersonal norms. (6) Mental contamination. (7) Unintended comparisons. (8) Topic and referent in perceptual comparisons. (9) Anchoring.

DESCRIPTORS: (U) *NORMALITY, *COGNITION,
*PERCEPTION(PSYCHOLOGY), CODING, COMPARISON,
CONTAMINATION, FOCUSING, LANGUAGE, NORMALITY, PROCESSING.

IDENTIFIERS: (U) PE61102F, WUAFOSR69120R.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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ARIZONA STATE UNIV TEMPE

(U) Stability and Transition of Hypersonic Boundary-Layer Flows.

PRESSURE GRADIENTS, REQUIREMENTS, ROUGHNESS, STABILITY, TEMPERATURE, TRANSITIONS, VELOCITY, WALLS, AIRCRAFT NOSES.

IDENTIFIERS: (U) WUAFOSR2307AS.

DESCRIPTIVE NOTE: Final rept..

APR 92 32P

PERSONAL AUTHORS: Reed, Helen L.; Saric, William S.

CONTRACT NO. F49620-88-C-0076

PROJECT NO. 2307

TASK NO. AS

MONITOR: AFOSR, XF
TR-92-0399, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This Final Report describes our research of hypersonic and supersonic boundary-layer flows. In spite of its extreme importance to the accurate prediction of drag and heating requirements in high-speed flow, the study of boundary-layer transition in hypersonic (NASP) and supersonic (fighter and high-speed civil transport) flows is still very much in its infancy. Transition is well known, however, to depend strongly on such effects as pressure gradient, wall curvature, sweep, roughness, wall mass transfer, freestream and wall temperature, nose radius, nonequilibrium chemistry, and freestream disturbances. (These effects have been discussed in any number of workshops and U.S. Transition Study Group meetings under the direction of Eli Reshotko.) We have completed detailed studies of the stability of the laminar basic state of 2-D and axisymmetric boundary layers with non-equilibrium chemistry included and 3-D boundary-layer flows of an ideal gas. (Relatively simple geometries were considered due to the anticipated difficulties in performing basic-state analyses.) Hypersonic, boundary layer stability.

DESCRIPTORS: (U) *BOUNDARY LAYER TRANSITION, *SUPERSONIC FLOW, *HYPERSONIC FLOW, *AEROSPACEPLANES, AXISYMMETRIC, BOUNDARY LAYER, CURVATURE, DRAG, GRADIENTS, HEATING, LAYERS, MASS TRANSFER, NUMBERS, PREDICTIONS, PRESSURE,

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OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A250 277 20/2 20/6 7/2
MINNESOTA UNIV MINNEAPOLIS DEPT OF CHEMICAL ENGINEERING
AND MATERIALS SCIENCE

(U) Crystallization Behavior of Chemically Synthesized
LiNbO₃

91 4P
PERSONAL AUTHORS: Joshi, Vikram

CONTRACT NO. F49620-89-C-0050

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR, XF
TR-92-0318, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Proceedings of the Electron
Microscopy Society of America (49th), p964-965, 1991.
Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) Lithium niobate is a material of interest
for electro-optic and nonlinear optical applications.
Conventional processing of lithium niobate involves the
relatively coarse scale of mixing of lithium carbonate
and niobium oxide powders, which makes it difficult to
obtain a chemically homogeneous, single phase product. In
recent years, sol-gel processing of lithium niobate has
been investigated as a method of producing high purity,
homogeneous material of stoichiometric composition. This
processing technique permits easy and precise control
over composition, intimate mixing of the constituent
elements, and the use of relatively low processing
temperatures. This present study investigates the
crystallization behavior of gels formed by the hydrolysis
of mixed alkoxides of lithium and niobium in low
molecular weight alcohols. Crystallization was found to
be initiated at temperatures as low as 200 C and could be
completely by 450 deg C.

DESCRIPTORS: (U) *CRYSTALLIZATION, *ELECTRON OPTICS,
*NONLINEAR OPTICS, *LITHIUM NIOBATES, GELS, REPRINTS.

IDENTIFIERS: (U) Alkoxides, PEB1102F, WUAFOSR2303A3.

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ILLINOIS UNIV AT URBANA DEPT OF CHEMISTRY

(U) Straight-Chain Alcohol Adsorption on the Ag(110)
Surface.

91 6P

PERSONAL AUTHORS: Zhang, Ruiming; Gellman, Andrew I.

CONTRACT NO. AFOSR-89-0278

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR, XF
TR-92-0324, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Physical Chemistry, v95
p7433-7437, 1991. Available to DTIC users only. No copies
furnished by NTIS.

ABSTRACT: (U) As models for the boundary layer films
formed on lubricated metal surfaces we have examined the
surface chemistry of a sct or straight-chain alcohols on
the clean Ag(110) surface. Consistent with previous
studies of methanol and ethanol on this surface we find
that all these alcohols are adsorbed completely
reversibly. The heats of adsorption increase
incrementally with addition of methylene groups to the
hydrocarbon chain following the form $H_d = 8.6 + (1.1 - 0.1)n$ kcal/mol for $CH_3(CH_2)_{10}H$. The formation of a
monolayer or methanol on the surface reduces the surface
work function by 1.15 eV, whereas for the longer chain
alcohols this number is decremented by -0.085 eV per
additional methylene group in the chain. The orientation
of the alkyl chain with respect to the surface has been
determined with the use of quantitative measurements of X-
ray photoemission from the C(1s) and O(1s) levels. We
find that the alkyl chains are oriented roughly parallel
to the surface rather than forming densely packed films
of a Langmuir-Blodgett type.

DESCRIPTORS: (U) *ADSORPTION, *ALCOHOLS, *ETHANOLS,
*FILMS, *METHANOLS, *SURFACE CHEMISTRY, *SILVER, ADDITION,
BOUNDARIES, BOUNDARY LAYER, CHAINS, CHEMISTRY, FUNCTIONS.

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DTIC REPORT BIBLIOGRAPHY

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HYDROCARBONS, LAYERS, MEASUREMENT, METALS, METHYLENES,
MODELS, NUMBERS, PHOTOELECTRIC EMISSION, SURFACES, WORK,
WORK FUNCTIONS, X RAYS, REPRINTS, TRIBOLOGY, LUBRICATION,
ULTRAHIGH VACUUM, INTERACTIONS.

ROCHESTER UNIV NY

(U) Function of Panel M Pathways in Primates.

DESCRIPTIVE NOTE: Final technical rept. 1 Oct 88-30 Sep 91,

APR 92 4P

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A2, *Straight
chain alcohols, ALKLY Chains, Langmuir-Blodgett films,
Solid-vacuum interfaces, Monolayer.

PERSONAL AUTHORS: Merigan, William

CONTRACT NO. AFOSR-89-0041

PROJECT NO. 2313

TASK NO. A8

MONITOR: AFOSR, XF
TR-92-0347, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Psychophysical threshold measures were used in combination with precisely located lesions of the sub-cortical visual pathway to examine segregation of function between P and M pathways. Scleral search coils monitored fixation locus in the tested monkeys, to insure that test stimuli were presented in visual field regions corresponding to the lesion location. Results of these studies indicated that the P pathway (or color-opponent pathway) is the major contributor to visual acuity, color vision, and luminance contrast sensitivity. On the other hand, the M pathway (or broad contours), as well as sensitivity to rapidly drifting visual stimuli. A special role for the M pathway in the processing of visual motion was ruled out by determining its contribution to directional and velocity sensitivity.

DESCRIPTORS: (U) *COLOR VISION, *VISUAL ACUITY, *PSYCHOPHYSIOLOGY, ACUITY, COILS, COLORS, CONTRAST, DIRECTIONAL, FUNCTIONS, HANDS, LESIONS, LOCUS, LUMINANCE, MONKEYS, MOTION, PROCESSING, REGIONS, SENSITIVITY, STIMULI, TEST AND EVALUATION, VELOCITY, VISION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A8.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 785005

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AD-A250 246 5/8 12/5

AEDAR CORP LANDOVER MD

PITTSBURGH UNIV PA DEPT OF BEHAVIORAL NEUROSCIENCE

(U) Computer Derivation of Green's Functions for Structural Dynamic Analysis.

(U) A Systems Theoretic Investigation of Neuronal Network Properties of the Hippocampal Formation.

DESCRIPTIVE NOTE: Final rept. 1 Sep 89-31 Aug 91.

DESCRIPTIVE NOTE: Final rept. 1 Dec 88-30 Nov 91.

OCT 91 80P

NOV 91 15P

PERSONAL AUTHORS: Fabunmi, James A.

PERSONAL AUTHORS: Berger, Theodore W.

REPORT NO. AEDAR-FTR-91-02

CONTRACT NO. AFOSR-89-0197

CONTRACT NO. F49620-89-C-0112

PROJECT NO. 2312

MONITOR: AFOSR, XF
TR-92-0342, AFOSR

TASK NO. A1

MONITOR: AFOSR, XF
TR-92-0363, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) This research program has been concerned with the development of a new generation of computer-aided techniques for the dynamic analysis of complex structural systems. These techniques which use powerful symbolic processors such as MACSYMA are expected to facilitate the derivation and analysis of Green's functions of interconnected distributed parameter structures. The present approach uses integral methods to combine the transfer functions of the baseline structure with those of discrete substructure attachments in order to obtain the transfer function of the interconnected system. This resultant transfer function is then transformed into a form which lends itself easily to inverse Laplace transformation, yielding the Green's function of the interconnected system. Such algebraic results are expected to improve the understanding of the effects of substructure attachments e.g. active and passive vibration controllers, on the dynamics of large flexible structures. Structural Dynamics, Computer Algebra, Green's Functions.

DESCRIPTORS: (U) *COMPUTER AIDED DIAGNOSIS, *GREENS FUNCTIONS, *STRUCTURAL ANALYSIS, ALGEBRA, APPROACH, COMPUTERS, DYNAMICS, FLEXIBLE STRUCTURES, FUNCTIONS, INTEGRALS, LAPLACE TRANSFORMATION, PARAMETERS, STRUCTURES, TRANSFER, TRANSFER FUNCTIONS, TRANSFORMATIONS, VIBRATION.

ABSTRACT: (U) The following Progress Report describes the results of the majority of our AFOSR-supported research for Year 3 of the project entitled A Systems Theoretic Investigation of Neuronal Network Properties of the Hippocampal Formation. The Progress Report is divided into six sections: a brief statement of the research objectives, an overview of general experimental and analytical procedures; research characterizing nonlinear response properties of the in vivo dentate gyrus; the extension of this research to the in vitro hippocampal slice; computer simulations of nonlinear response properties of the dentate based on the experimental work; and a listing of publications during the past year of support.

DESCRIPTORS: (U) *COMPUTERIZED SIMULATION, *HIPPOCAMPUS, COMPUTERS, DOCUMENTS, MAJORITIES, NETWORKS, RESPONSE, SIMULATION, WORK, MATHEMATICAL MODELS, MEMORY (PSYCHOLOGY).

IDENTIFIERS: (U) PEG1102F, WUAFOSR2312A1, *Hippocampal formation, *Neuronal networks.

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MASSACHUSETTS UNIV MEDICAL SCHOOL WORCESTER DEPT OF
NEUROLOGY

vision, Complex cells, *Nonlinear visual circuits.

(U) Non-Linear Analysis of Visual Cortical Neurons.

DESCRIPTIVE NOTE: Final rept. 1 Jan 89-31 Dec 91,

APR 92 26P

PERSONAL AUTHORS: Jacobsen, Lowell D.; Gaska, James P.;
Pollen, Daniel A.

CONTRACT NO. AFOSR-89-0247

PROJECT NO. 2313

TASK NO. A8

MONITOR: AFOSR, XF
TR-92-0307, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Quantitative procedures were developed for testing block-structured models for multi-input nonlinear visual circuits studied with spatiotemporal white noise. A linear-nonlinear (LN) model test index was found to be suitable for classifying cells as simple versus complex. Although simple cells were better modeled as LN systems than complex cells, most simple cells deviated considerably from LN behavior. A nonlinearity of cortical origin would appear to be responsible, possibly activated more strongly by broadband noise than by sine-wave grating stimuli. Also, two classes of binocular complex cells were identified. Whereas all binocular complex cells necessarily have a non-zero second-order same-eye interaction kernel, their second-order cross-eye interaction kernel could, it was found, be either non-zero or identically zero. Binocular vision, nonlinear system identification, neural network.

DESCRIPTORS: (U) *NONLINEAR ANALYSIS, *VISUAL CORTEX, BEHAVIOR, BINOCULARS, BROADBAND, CELLS, CIRCUITS, IDENTIFICATION, INDEXES, INPUT, INTERACTIONS, MODEL TESTS, MODELS, MONKEYS, NOISE, STIMULI, TEST AND EVALUATION, VISION, WHITE NOISE.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A8, *Binocular

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GEORGE WASHINGTON UNIV WASHINGTON DC SCHOOL OF
ENGINEERING AND APPLIED SCIENC E

OREGON STATE UNIV NEWPORT HATFIELD MARINE SCIENCE CENTER

(U) Development and Application of New Algorithms for the
Simulation of Compressible flows with Moving Bodies in
Three Dimensions.

(U) In Search of a Unified Theory of Biological
Organization: What Does the Motor System of a Sea Slug
Tell Us About Human Motor Integration?

DESCRIPTIVE NOTE: Final rept. 15 Sep 90-14 Sep 91,

DESCRIPTIVE NOTE: Rept. for 15 Jan 89-14 Jan 92,

MAR 92 59P

APR 92 71P

PERSONAL AUTHORS: Lohner, Rainald; Cabello, Jean

PERSONAL AUTHORS: Mpitsos, George J.; Soinilla, Seppo

CONTRACT NO. AFOSR-89-0540

CONTRACT NO. AFOSR-89-0262

PROJECT NO. 2307

PROJECT NO. 2312

TASK NO. AS

TASK NO. A1

MONITOR: AFOSR, XF

MONITOR: AFOSR, XF

TR-92-0369, AFOSR

TR-92-0299, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Original contains color plates: A11
DTIC reproductions will be in black and white.

ABSTRACT: (U) We summarize the behavioral,
electrophysiological, and immunohistochemical findings in
the sea slug, Pleurobranchaea, and compare these finding
to those obtained in other invertebrate animals, in
higher animals, and in humans. The findings show that
there is massive distribution and sharing of information
occurring, respectively, through diverging and converging
network connections. We examine the findings of
reductionist approaches and find them inadequate to
answer the problems arising from such widely distributed,
multifunctional, and highly converging networks whose
activity may be variable. Such findings indicate that
cooperative actions among groups of neurons may arise
dynamically and nonlinearly in shifting contexts or
consensuses of response in which individual neurons may
have different functions, even during times when the
behaviors are similar. Control of these systems is
emergent, fuzzy, and error-prone rather than being
reflexive or following explicit causes and effects that
can be read from the switchboard circuit of the
connections between neurons. A unified theoretical
perspective is needed that accounts for both the emergent
and switch-board systems. Two problems apply in both
cases: First, animals may have evolved highly specialized
behaviors whose underlying neural networks may not

ABSTRACT: (U) A new CFD capability for compressible
flows with moving bodies was developed. The salient
features of this capability are: (a) Fast and reliable 3-
D unstructured grid generation; (b) Flow solvers for
moving frames of reference; (c) Adaptive mesh
regeneration during transient runs; (d) On-line display
of results; (e) Post-processing and movie-making
capability. Unstructured Grid, 3-D, Adaptive Mesh.

DESCRIPTORS: (U) *COMPRESSIBLE FLOW, *COMPUTERIZED
SIMULATION, *ALGORITHMS, BODIES, FLOW, FRAMES, GRIDS,
MESH, PROCESSING, TRANSIENTS, THREE DIMENSIONAL, MOTION.

IDENTIFIERS: (U) PEB1102F, WUAFOSR2307AS.

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necessarily reflect generally applicable principles. Second, owing to their complexity, it may not be possible to characterize biological networks in sufficient detail to permit an understanding of the system through simulation of the system itself. Parallel processing, attractors, learning, chaos, bifurcation, immunohistochemistry, neurotransmitters, neural networks.

DESCRIPTORS: (U) *NETWORKS, *NEUROTRANSMITTERS, *PARALLEL PROCESSING, ANIMALS, APPROACH, BEHAVIOR, CHAOS, CIRCUITS, CONTROL, DISTRIBUTION, ERRORS, FUNCTIONS, HUMANS, INVERTEBRATES, LEARNING, NERVE CELLS, OCEANS, PROCESSING, RESPONSE, SHARING, SHIFTING, SIMULATION, SWITCHES, VARIABLES.

IDENTIFIERS: (U) PE61102F, WJAFOSR2312A1, *Neural networks, Immunohistochemistry, Attractors, Sea slugs, *Human motor integration.

AD-A250 221 20/4

OXFORD UNIV (UNITED KINGDOM) DEPT OF ENGINEERING SCIENCE

(U) Turbulent Spot Generation and Growth Rates in a Transonic Boundary Layer.

DESCRIPTIVE NOTE: Final rept. 15 May 89-14 Oct 91,

MAR 92 24P

PERSONAL AUTHORS: Clark, J. P.; LeGraft, J. E.; Jones, T. V.

CONTRACT NO. AFOSR-89-0427

PROJECT NO. 2307

TASK NO. DS

MONITOR: AFOSR, XF
TR-92-0365, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Wide-bandwidth surface heat transfer instrumentation has been used to track the generation, convection and growth of turbulent spots in a laminar boundary layer undergoing transition to turbulence. The model was a flat plate subjected to a range of free stream conditions in a piston-driven isentropic compression heated transient wind tunnel at Oxford University. Freestream Mach number (subsonic to 2.0), freestream turbulence and streamwise pressure gradient (favorable to adverse) were varied. Preliminary analysis of the time-resolved heat transfer data allowed estimates of spot convection rates, generation rates and spreading angles to be estimated. Convection rates were little affected by Mach number whereas spreading angles were narrowed by favorable pressure gradients and expanded by adverse gradients, boundary layers, transition, turbulent spots compressibility effects

DESCRIPTORS: (U) *COMPRESSIVE PROPERTIES, *HEAT TRANSFER, *STREAMS, *TURBULENCE, *BOUNDARY LAYER TRANSITION, ANGLES, BANDWIDTH, BOUNDARIES, BOUNDARY LAYER, COMPRESSION, CONVECTION, ESTIMATES, FREE STREAM, GRADIENTS, HEAT, INSTRUMENTATION, LAMINAR BOUNDARY LAYER, LAYERS, MACH NUMBER, MODELS, NUMBERS, PISTONS, PLATES, PRESSURE, PRESSURE GRADIENTS, RATES, SURFACES, TIME, TRACKS.

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TRANSFER, WIND TUNNELS, TRANSONIC CHARACTERISTICS.

STANFORD UNIV CA DEPT OF MATERIALS SCIENCE AND
ENGINEERING

IDENTIFIERS: (U) PE61102F, WUAFOSR2307DS.

(U) High Temperature Deformation Processes and
Strengthening Mechanisms in Intermetallic Particulate
Composites.

DESCRIPTIVE NOTE: Final technical rept. Dec 88-Dec 91.

MAR 92 46P

PERSONAL AUTHORS: Nix, William D.; Forbes, Keith R.;
Sternbergh, D. D.

CONTRACT NO. F49620-92-J-0009, SAFOSR-89-0201

MONITOR: AFOSR, AFOSR, XF
TR-92-0356, 92-1, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Research on the high temperature deformation processes and strengthening mechanisms in Intermetallic Particulate Composites is described. Work of the grant included high temperature compression tests of Ni3Al - Al2O3 composites; mechanical alloying of Ni3Al + Y 2 O3 ; transient deformation studies of the intermetallics Ni 3 Al, NiAl, NiBe; and development of a model of dislocation structure control of plastic deformation. Work during the past year on the high temperature deformation of NiAl single crystals is also described. Intermetallic Alloys, High Temperature Strength.

DESCRIPTORS: (U) *DEFORMATION, *SINGLE CRYSTALS, *NICKEL INTERMETALLICS, *ALUMINUM INTERMETALLICS, ALLOYS, COMPRESSION, CONTROL, CRYSTALS, DISLOCATIONS, GRANTS, HIGH TEMPERATURE, MODELS, PARTICULATES, PLASTIC DEFORMATION, PLASTICS, STRUCTURES, TEMPERATURE, TEST AND EVALUATION, TRANSIENTS, WORK, STRENGTH(MECHANICS), ALUMINUM, NICKEL ALLOYS, INTERMETALLIC COMPOUNDS, DENSITY, BERYLLIUM, POLYCRYSTALLINE, CREEP.

IDENTIFIERS: (U) Intermetallics, Compressive strength, Compression tests.

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TEXAS UNIV AT EL PASO DEPT OF MATHEMATICAL SCIENCES

EXPECTANCY(SERVICE LIFE).

(U) Estimation of the Point of Incipient Deterioration and
a Class of Life Distribution with Application to
Cannibalization.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5.

DESCRIPTIVE NOTE: Final rept. 1 Jul 89-30 Sep 91,

JAN 92 10P

PERSONAL AUTHORS: Rojo, Javier

CONTRACT NO. F49620-89-C-0085

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR, XF
TR-92-0291, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The training problem for feedforward neural networks is nonlinear parameter estimation that can be solved by a variety of optimization techniques. Much of the literature on neural networks has focused on variants of gradient descent. The training of neural networks using such techniques is known to be a slow process with more sophisticated techniques not always performing significantly better. It is shown that feedforward neural networks can have ill-conditioned Hessians and that this ill-conditioning can be quite common. The analysis and experimental results lead to the conclusion that many network training problems are ill-conditioned and may not be solved more efficiently by higher order optimization methods. The analysis are for completely connected layered networks, they extend to networks with sparse connectivity as well. The results suggest that neural networks can have considerable redundancy in parameterizing the function space in a neighborhood of a local minimum, independently of whether or not the solution has a small residual.

DESCRIPTORS: (U) *STATISTICAL DISTRIBUTIONS,
*NONPARAMETRIC STATISTICS, *CANNIBALIZATION, DESCENT,
FUNCTIONS, GRADIENTS, NETWORKS, OPTIMIZATION, PARAMETERS,
REDUNDANCY, TRAINING, NEURAL NETS, LIFE

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POLYTECHNIC UNIV FARMINGDALE NY WEBER RESEARCH INST

(U) In-Situ Fault Detection by the Hybrid Ray-Mode Method.

DESCRIPTIVE NOTE: Final technical rept. 1 Mar 90-30 Sep 91.

APR 92 104P

PERSONAL AUTHORS: Felsen, Leopold B.

REPORT NO. POLY-WRI-1589-92

CONTRACT NO. AFOSR-90-0088

PROJECT NO. 2306

TASK NO. A3

MONITOR: AFOSR, XF
TR-92-0349, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The objective of this research effort has been to develop algorithms for in-situ location and identification, by ultrasound, of flaws in plates or laminated layered elastic materials. Achieving this objective requires detailed knowledge of the excitation propagation, scattering and detection of high frequency sound waves in unflawed and flawed environments. Based on an understanding of these fundamental wave phenomena, one may then attempt to construct analytical models with accompanying algorithms, so as to parametrize the NDE problem in terms of good observables. During this final period, the research program under the predecessor grant No. AFOSR-86-0318 was phased out. Major effort was expanded on completing research items initiated under the predecessor grant, and on preparing final manuscripts for publication. For the description of these previous studies, the readers should refer to the Final Report on the predecessor grant. A new phase was initiated during the current period, namely, a systematic study of nonspecular reflection of ultrasonic acoustic beams impinging from a fluid onto planar and cylindrical layered elastic materials. The nonspecular effect occurs when the incident beam is phase matched to a leaky mode in the structure and thereby causes the reflected field

to be dominated by strong interaction between the specularly reflected beam profile and the leaky mode. Gaussian beam complex-source-point method, beam-to-mode conversion in elastic plates, transducer output modeling by Gaussian beams, hybrid beam-mode methods, weak debond ultrasonic.

DESCRIPTORS: (U) *ULTRASONIC TESTS, *DEFECT ANALYSIS, *ELASTIC PROPERTIES, *DEFECTS(MATERIALS), ACOUSTIC BEAMS, ACOUSTICS, ALGORITHMS, CONVERSION, DETECTION, DOCUMENTS, ENVIRONMENTS, EXCITATION, FLUIDS, FREQUENCY, GRANTS, HIGH FREQUENCY, IDENTIFICATION, INTERACTIONS, MATERIALS, MODELS, OUTPUT, PHASE, PLATES, PROFILES, PROPAGATION, REFLECTION, SCATTERING, SOUND, SOUND WAVES, STRUCTURES, TRANSDUCERS, ULTRASONICS, LAMINATES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2306A3.

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VIRGINIA POLYTECHNIC INST AND STATE UNIV BLACKSBURG DEPT
OF ELECTRICAL ENGINEERING

PRINCETON UNIV NJ DEPT OF CHEMICAL ENGINEERING

(U) Control of Nonlinear Distributed Parameter Systems
With Application to Flow Control.

(U) Recent Advances in Global Optimization.

DESCRIPTIVE NOTE: Final technical rept. 1 Aug 89-31 Dec 91,

DESCRIPTIVE NOTE: Final technical rept. 1 Aug 89-31 Dec 91,

DEC 91

7P

MAR 92

8P

PERSONAL AUTHORS: Baumann, William T.; Banach, Antoni S.

PERSONAL AUTHORS: Floudas, C. A.; Pardalos, P. M.

CONTRACT NO. AFOSR-89-0495

CONTRACT NO. AFOSR-91-0116

PROJECT NO. 2304, 2304

PROJECT NO. 2304

TASK NO. A1, A5

TASK NO. A8

MONITOR: AFOSR, XF
TR-92-0371, AFOSR

MONITOR: AFOSR, XF

TR-92-0354, AFOSR

UNCLASSIFIED REPORT

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ABSTRACT: (U) The goal of this project was to put the intuitive idea of gain-scheduling on a rigorous foundation for a class of nonlinear, distributed-parameter systems. This involved a study of the existence and characterization of the ideal, infinite-dimensional, feedback control. Since in most applications the feedback function cannot be computed in closed form it was necessary to study the convergence of approximate feedback functions, based on increasingly higher order finite-dimensional approximations of the system, to the ideal function. Finally, the results were applied to Burgers' Equation, which can be viewed as a low-order approximation to a wide variety of physical phenomena, including viscous compressible flow.

ABSTRACT: (U) The conference on Recent Advances in Global Optimization took place during May 10-11, 1991 at Princeton University. It was organized by Professor C.A. Floudas (Princeton University) and P.M. Pardalos (Penn State) and supported by AFOSR under grant AFOSR-91-0116. The conference was very successful and attracted researchers from a wide spectrum of interests and activities that is reflected in applied mathematics, computer sciences, operations research, chemical, civil, mechanical and electrical engineering, biochemistry and chemistry. It represents the first truly international conference devoted exclusively on the subject of global optimization, having 80 participants from USA, Germany, Finland, Italy, France, Vietnam, Russia, Canada, Portugal and Mexico. Princeton University recently published a book (Eds. Floudas and Pardalos) with the referred papers presented at the conference and the Journal of Global Optimization is going to devote two issues on selected papers of this conference.

DESCRIPTORS: (U) *CONTROL THEORY, *NONLINEAR SYSTEMS, *FLUID CONTROL, CONTROL, CONVERGENCE, EQUATIONS, FEEDBACK, FUNCTIONS, GAIN, PARAMETERS, SCHEDULING, VISCOUS FLOW, COMPRESSIBLE FLOW.

DESCRIPTORS: (U) *GLOBAL, *OPERATIONS RESEARCH, *OPTIMIZATION, APPLIED MATHEMATICS, BIOCHEMISTRY, CANADA, CHEMICALS, CHEMISTRY, COMPUTERS, ELECTRICAL ENGINEERING, ENGINEERING, FINLAND, FRANCE, GERMANY, GRANTS, INTERNATIONAL, ITALY, MATHEMATICS, MEXICO, OPERATION, PORTUGAL, USSR, UNIVERSITIES, VIETNAM, SYMPOSIA.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304A1, WUAFOSR2304AS.

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IDENTIFIERS: (U) PE61102F, WUAFOSR2304A8.

MICHIGAN STATE UNIV EAST LANSING

(U) Sensitivity to Turbulent Boundary Layer Production Mechanisms to Turbulence Control.

DESCRIPTIVE NOTE: Final rept. 1 Oct 87-31 Mar 91,

MAR 91 9P

PERSONAL AUTHORS: Falco, R. E.

CONTRACT NO. AFOSR-87-0047

PROJECT NO. 2307

TASK NO. 85

MONITOR: AFOSR, XF
TR-92-0395, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Initial experiments to explore ways to modify the key aspects of the turbulence production mechanism were made. The proposed phased momentum bursts proved too difficult for us to quantify. When applied, changes were visually observed to occur, but the changes that occurred always seemed to result in different evolutions from instant even though the same perturbation was applied, and thus defied quantification. Therefore, we took a different approach, and determined in a statistical sense what the magnitude and the time scale of a momentum perturbation should be if we are going to precisely after the essential coherent motions. We have found these scales by constructing a complete structural model of the turbulent boundary layer (Proc. Roy. Soc. Lond. A 336, 103-129, 1991), and by showing that it properly scales the intensities and Reynolds stresses. This scaling allows us to predict intensities and Reynolds stress magnitudes. From the point of view of control, it tells us, on a statistical basis, how much momentum to use in a control scheme, and for how long to apply it, for any Reynolds number and position in the layer. Turbulence, Boundary layer, Turbulence control.

DESCRIPTORS: (U) *BOUNDARY LAYER CONTROL, *SHEAR STRESSES, *TURBULENCE, APPROACH, BOUNDARIES, BOUNDARY LAYER, CONTROL, LAYERS, MODELS, MOMENTUM, NUMBERS.

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PERTURBATIONS, PRODUCTION, REYNOLDS NUMBER, RUPTURE,
SCALE, STRESSES, TIME.

IDENTIFIERS: (U) Reynolds stresses, Turbulence control.

AD-A250 209 20/4

PRINCETON UNIV NJ

(U) The Structure and Control of Three-Dimensional Shock
Wave Turbulent Boundary Layer Interactions.

DESCRIPTIVE NOTE: Final rept. 1 Oct 88-31 Aug 91,

MAR 92 30P

PERSONAL AUTHORS: Bogdonoff, Seymour M.; Smits, Alexander
J.

CONTRACT NO. AFOSR-89-0033

PROJECT NO. 2307

TASK NO. A1

MONITOR: AFOSR, XF
TR-92-0388, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The three year period covered in the subject report was a considerable shift from the previous years of work on shock wave turbulent boundary layer interactions. The earlier work concentrated on simple building block experiments and a search for fundamental understanding of the flow phenomena. In the subject research, most of the work on fundamentals for the simple configurations was stopped. The main emphasis for the first two years of the current program was on complex configurations and the final year was a close-out program on a new approach. The work on complex configurations was limited to two geometries which used the much studied single sharp fin interaction, Fig. 1, as the initial conditions. This shift in emphasis had two main purposes: (1) block experiments in more complex interactions required for applications and (2) to provide a more critical test of computation which, although giving the general characteristics for the building block experiments, did not give highly quantitative results. The primary activities for the first two years will be discussed in three major groupings: (1) and (2) Discussions of the two complex configurations, and (3) a description of the boundary layer conditions which are critical to the definition of the experiment and the check by computational fluid dynamics.

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PRINCETON UNIV NJ

DESCRIPTORS: (U) *TURBULENT BOUNDARY LAYER, BOUNDARIES, BOUNDARY LAYER, BUILDINGS, COMPUTATIONS, CONFIGURATIONS, DYNAMICS, FINS, FLOW, FLUID DYNAMICS, INTERACTIONS, LAYERS, SHOCK, SHOCK WAVES, TEST AND EVALUATION.

(U) Development of a High-Performance Fortran Compiler for Porting CFD Codes to the Navier-Stokes Computer.

DESCRIPTIVE NOTE: Final rept. 1 Nov 90-31 Oct 91,

IDENTIFIERS: (U) PE61102F, WUAFOSR2307A1, Computerized fluid dynamics.

MAY 92 7P

PERSONAL AUTHORS: Nosenchuck, Daniel M.

CONTRACT NO. AFOSR-91-0003

PROJECT NO. 2307

TASK NO. AS

MONITOR: AFOSR, XF
TR-92-0389, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Research on developing a high-performance FORTRAN compiler for the Navier-Stokes Compute (NSC) was performed during the contractual period. The thrust of the work was to develop a prototype compiler the NSC MiniNode. The NSC MiniNode is an operational prototype of hardware node, that represents the key building block of a parallel-processing supercomputer whose architecture was designed to support the efficient simulation of large-scale complex fluid flows. Fortran, Compiler, Navier-Stokes, CFD.

DESCRIPTORS: (U) *COMPILERS, *SOFTWARE ENGINEERING, *NAVIER STOKES EQUATIONS, ARCHITECTURE, BUILDINGS, FORTRAN, FLUIDS, NODES, PARALLEL PROCESSING, PROCESSING, PROTOTYPES, SCALE, SIMULATION, SUPERCOMPUTERS, THRUST, WORK, FLUID FLOW.

IDENTIFIERS: (U) WUAFOSR2307AS, PE61102F.

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DTIC RE RT BIBLIOGRAPHY SEARCH CONTROL NO. 185005

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RENSELAER POLYTECHNIC INST TROY NY

(U) Kinetic Studies of Metal Combustion in Propulsion.

DESCRIPTIVE NOTE: Final rept. 1 Dec 88-29 Feb 82.

APR 92 15P

PERSONAL AUTHORS: Fontijn, Arthur

CONTRACT NO. AFOSR-89-0086

PROJECT NO. 2308

TASK NO. A1

MONITOR: AFOSR, XF
TR-92-0390, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Advanced propulsion system designs require quantitative understanding of the temperature-dependent kinetics of the gas-phase oxidation reactions of the metallic fuel components. To this end experimental rate coefficient measurements have been made on aluminum and boron species, in the 440-1830 K temperature range, in a high-temperature fast-flow reactor (HTFFR). Results are reported for the following individual reactions: $Al + N_2O$; $AlO + C12$; $AlO + HC1$; $AlO + CH_4$; $AlCl + C O_2$; $AlCl + N_2O$; $AlCl + HC1$; $BC1 + C O_2$; $BC1 + N_2O$; $BC1 + S O_2$. The reaction products are discussed. For several series of homologous exothermic reactions correlations are established between the activation barriers and the sums of the s-p (or sigma-pie) promotion energies and the ionization potentials of the metallic reactants minus the electron affinities of the oxidants. These series are the reactions of alkali metal atoms with N_2O , group 2 and transition metal atoms with N_2O , boron group atoms with N_2O , and $AlCl$, $BC1$, BF and BH with O_2 , $C O_2$, N_2O and $S O_2$. These correlations are explained on the basis of chemical resonance theory. Calculations based on this semi-empirical approach are shown to agree well with experiment. Combustion Kinetics, Ramjets, AlO , BH , High Temperature, $AlCl$, $BC1$, Solid Rocket Propulsion.

DESCRIPTORS: (U) *ALUMINUM, *COMBUSTION, *ROCKET PROPULSION, *REACTION KINETICS, ACTIVATION, ALKALI METALS,

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APPROACH, ATOMS, BARRIERS, BORON, CHEMICALS, COEFFICIENTS, ELECTRONS, EXOTHERMIC REACTIONS, FLOW, FUELS, HIGH TEMPERATURE, IONIZATION, IONIZATION POTENTIALS, KINETICS, MEASUREMENT, METALS, OXIDATION, OXIDIZERS, PHASE, PROPULSION SYSTEMS, RATES, RESONANCE, ROCKETS, SOLIDS, TEMPERATURE, THEORY, TRANSITION METALS, TRANSITIONS, VAPOR PHASES, ALUMINUM OXIDES, SOLID ROCKET PROPELLANTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A1.

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SEARCH CONTROL NO. T85005

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PURDUE UNIV LAFAYETTE IN DEPT OF CHEMISTRY

(U) Asynchronous Optical Sampling for Laser-Based Combustion Diagnostics in High-Pressure Flames.

DESCRIPTIVE NOTE: Final rept. 15 Dec 88-14 Dec 91,

APR 92

12P

PERSONAL AUTHORS: King, G. B.; Laurendeau, N. M.; Lytle, F. E.

CONTRACT NO. AFOSR-89-0051

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR, XF
TR-92-0391, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This is the final report on the development of a new laser-based combustion diagnostic for the quantitative measurement of both major and minor species in high-pressure flames. The technique, Asynchronous Optical Sampling (ASOPS), is a state-of-the-art improvement in picosecond pump/probe spectroscopy. A method is presented for vastly improving the output of the synchronously mode-locked dye laser systems. The beat frequency is increased to 155.7 kHz. Subnanosecond excited-state lifetimes for Na are obtained with only 128 averages, for the first time allowing data to be obtained within the time scale of turbulence. The first quantitative evaluation of the ASOPS technique in a flame environment is presented. Pump/probe spectroscopy, Laser diagnostics, Combustion, Stimulated emission.

DESCRIPTORS: (U) *COMBUSTION, *LASER PUMPING, DYE LASERS, EMISSION, ENVIRONMENTS, FLAMES, HIGH PRESSURE, MEASUREMENT, OUTPUT, PRESSURE, PROBES, PUMPS, SCALE, SPECTROSCOPY, STATE OF THE ART, TIME, TURBULENCE, DIAGNOSTICS(GENERAL), EMISSION SPECTROSCOPY, LASER APPLICATIONS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A2, *Laser diagnostics, ASOPS(Asynchronous Optical Sampling).

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UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF CHEMISTRY

(U) Gas-Surface Interactions Near Dissociation Threshold.

DESCRIPTIVE NOTE: Final rept. Nov 88-Oct 91.

MAR 92

12P

PERSONAL AUTHORS: Reisler, Hanna; Wittig, Curt

CONTRACT NO. AFOSR-89-0057

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR, XF
TR-92-0306, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The main thrust of our program was directed towards the study collision-induced dissociation (CID) of hyperthermal molecules on insulators (MgO), semiconductors (GaAs) and metals (Ag). Supersonic beams of nitroso compounds entered the UHV chamber with kinetic energies variable between 0.5 and 7 eV. NO products were detected state-selectively using two-frequency laser ionization. CID yields were measured as a function of surface temperature and incident kinetic energy, and complete energy deposition in the NO product was determined in each case. CID yields rise sharply with incident kinetic energy, with non-vanishing values even slightly below dissociation threshold at high surface temperature. The yield depends on the stiffness of the surface. The NO distributions are similar to those obtained in the gas-phase unimolecular decomposition of these molecules and indicate a broad distribution of internal energies. In the newest phase of this program, the photodissociation of CINO adsorbed on a rough MgO surface is studied at 365 nm. The NO state distributions differ greatly from those obtained in gas-phase photodissociation and suggest that CINO aggregates as islands on the surface and the NO and Cl undergo multiple collisions before desorption. Surface, Collision-Induced Dissociation, Photodissociation.

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SEARCH CONTROL NO. T85005

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DESCRIPTORS: (U) *KINETIC ENERGY, *PHOTODISSOCIATION, *SURFACE TEMPERATURE, CHAMBERS, COLLISIONS, DECOMPOSITION, DEPOSITION, DESORPTION, DISSOCIATION, DISTRIBUTION, ENERGY, FREQUENCY, FUNCTIONS, INTERNAL, IONIZATION, ISLANDS, KINETICS, LASERS, MOLECULES, NITROSO COMPOUNDS, PHASE, STIFFNESS, SURFACES, TEMPERATURE, THRUST, VALUE, VARIABLES, YIELD, MAGNESIUM OXIDES, GALLIUM ARSENIDES, SEMICONDUCTORS, SILVER.

IDENTIFIERS: (U) PE61102F, WUAFOSR230381, *CID(Collision Induced Dissociation), Insulators.

AD-A250 204 20/12

STANFORD UNIV CA EDWARD L GINZTON LAB OF PHYSICS

(U) Stanford Center for Research on Superconductivity and Superconductive Electronics.

DESCRIPTIVE NOTE: Final rept. 15 Oct 88-14 Oct 91,

MAR 92 18P

PERSONAL AUTHORS: Beasley, M. R.

CONTRACT NO. F49620-89-C-0001

PROJECT NO. 2306

TASK NO. C1

MONITOR: AFOSR, XF
TR-92-0293, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) New techniques for growing epitaxial thin films of high temperature superconducting cuprates have been developed. The electrical and superconducting properties of the thin film have been investigated by transport, magnetic, optical and tunneling measurements. Insights into the basic nature of the superconducting interaction and the physics of some superconducting devices have been gained. superconductivity, superconducting electronics, thin film high temperature cuprates.

DESCRIPTORS: (U) *SUPERCONDUCTIVITY, ELECTRONICS FILMS, HIGH TEMPERATURE, INTERACTIONS, MEASUREMENT, PHYSICS, TEMPERATURE, THIN FILMS, TRANSPORT, TUNNELING, SPUTTERING, CRYSTAL GROWTH, SUBSTRATES.

IDENTIFIERS: (U) PE61102F, WUAFOSR23061.

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OHIO STATE UNIV RESEARCH FOUNDATION COLUMBUS

STANFORD UNIV CA DEPT OF MECHANICAL ENGINEERING

(U) Demodulation Processes in Auditory Perception.

(U) Mathematical Modeling and Numerical Simulation of the Dynamics of Flexible Structures Undergoing Large Overall Motions.

DESCRIPTIVE NOTE: Annual rept. 1 Dec 89-30 Nov 90,

DESCRIPTIVE NOTE: Final rept. 15 Feb 89-14 May 91.

MAR 92 6P

PERSONAL AUTHORS: Feth, Lawrence L.

MAY 91 11P

CONTRACT NO. AFOSR-89-0227

PERSONAL AUTHORS: Simo, J. C.

PROJECT NO. 2313

CONTRACT NO. AFOSR-89-0294

TASK NO. A6

PROJECT NO. 2304

MONITOR: AFOSR, XF

TASK NO. A1

TR-92-0300, AFOSR

MONITOR: AFOSR, XF
TR-92-0287, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The development of a multi-channel version of the EWAIF model has begun. The revised model is the IWAIF, or Intensity Weighted Average of Instantaneous Frequency model. The intensity is proportional to the square of the amplitude (or envelope) and in an earlier paper the PI had shown that envelope squared weighting worked at least as well as simple envelope weighting. Anantharaman's work, which he used as his masters thesis, led to a much more efficient calculation scheme. The model helps understand the intuitive notion that a signal's IWAIF value is its spectral center of gravity. Thus, IWAIF calculations may indeed have application to spectral shape discriminations.

DESCRIPTORS: (U) *AUDITORY PERCEPTION, *EAR, CENTER OF GRAVITY, CHANNELS, FREQUENCY, GRAVITY, INTENSITY, MODELS, SHAPE, THESES, HUMANS, DEMODULATION, AMPLITUDE.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A6, Weighting.

ABSTRACT: (U) The work reported on is part of a multidisciplinary effort aimed at the development of analytical and computational tools for the modeling and simulation of very flexible structures. This research is concerned with three main areas (1) Mathematical aspects, with special emphasis on nonlinear stability analysis; (2) Modeling aspects, with emphasis in very flexible slender structures; and (3) Numerical analysis aspects, with emphasis on methodologies suitable for large scale and accurate simulation. The present research effort has resulted in 36 publications, two conferences, and a strong collaboration (in a related research effort also sponsored by AFOSR) with groups at UC Berkeley and U. Maryland.

DESCRIPTORS: (U) *FLEXIBLE STRUCTURES, *MATHEMATICAL MODELS, DOCUMENTS, MARYLAND, NUMERICAL ANALYSIS, SCALE, SIMULATION, STABILITY, STRUCTURES, TOOLS, MOTION.

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 UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF
 CHEMISTRY

AD-A250 200 5/8
 UTAH UNIV SALT LAKE CITY DEPT OF PSYCHOLOGY
 (U) Studies of Perceptual Memory.

(U) Silicon Polymers.

DESCRIPTIVE NOTE: Final rept.,
 DESCRIPTIVE NOTE: Final technical rept. 1 Feb 89-31 Jan 92.

APR 92 12P

JAN 92 44P

PERSONAL AUTHORS: Weber, William P.

PERSONAL AUTHORS: Johnston, William A.; Hawley, Kevin J.;
Farnham, James M.

CONTRACT NO. AFOSR-89-0007

CONTRACT NO. AFOSR-89-0275

PROJECT NO. 2303

PROJECT NO. 2313

TASK NO. 82

TASK NO. A4

MONITOR: AFOSR, XF
TR-92-0289, AFOSRMONITOR: AFOSR, XF
TR-92-0308, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Unsaturated carbosilane polymers have been prepared by anionic as well as metathesis polymerization of silacyclopent-3-enes. Of particular interest, is unsaturated carbosilane polymers with Si-H substitution have been prepared. These complementary functionalities permit crosslinking by hydrosilation reactions to yield new coating materials which have low dielectric constants and moisture absorption. These polymers can be chemically modified by addition reaction, to the carbon-carbon double bonds. unsaturated, carbosilane polymers, silicon-hydride.

DESCRIPTORS: (U) *ABSORPTION, *CARBON, *COATINGS, *POLYMERS, *SILICON, *UNSATURATED HYDROCARBONS, *ANIONS, ADDITION, ADDITION REACTIONS, CONSTANTS, DIELECTRICS, HYDRIDES, MATERIALS, MOISTURE, POLYMERIZATION, YIELD, CROSSLINKING(CHEMISTRY).

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303B2, Metathesis polymerization, *Silacyclopent-3-enes, Hydrosilation reactions, *Silicone hydrogen substitution.

ABSTRACT: (U) Perceptual memory refers to experience-induced changes in perceptual processing of particular objects or scenes. Part 1 of this report summarizes the results of 8 studies of the role of perceptual memory in recognition memory. The hypothesis was confirmed that perceptual memory-contributes to the feeling of familiarity that observers sometimes experience even when they lack explicit memory for previously encountered objects. Part 2 summarizes the results of 14 studies of a by-product of perceptual memory called novel popout. The theory was confirmed that novel popout arises from the automatic disinhibition of processing of objects that fail to match top-down effects of perceptual memory.

DESCRIPTORS: (U) *PERCEPTION(PSYCHOLOGY), *MEMORY(PSYCHOLOGY), AUTOMATIC, OBSERVERS, PROCESSING, RECOGNITION, THEORY.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2313A4.

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SEARCH CONTROL NO. T85005

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VIRGINIA POLYTECHNIC INST AND STATE UNIV BLACKSBURG DEPT
OF MATHEMATICS

RUTGERS - THE STATE UNIV NEW BRUNSWICK NJ DEPT OF
PSYCHOLOGY

(U) An Integrated Research Program for the Modeling,
Analysis and Control of Aerospace Systems.

(U) Eye Movements and Visual Information Processing.

DESCRIPTIVE NOTE: Final rept. 31 Aug 87-30 Sep 91.

DESCRIPTIVE NOTE: Final rept. 1 Apr 88-30 Sep 91.

MAR 92 30P

SEP 91 6P

PERSONAL AUTHORS: Burns, J. A.; Cliff, E. M.; Herdman, T.
L.

PERSONAL AUTHORS: Kowler, Eileen

CONTRACT NO. AFOSR-92-0292

CONTRACT NO. AFOSR-88-0171

PROJECT NO. 6121

PROJECT NO. 2312

TASK NO. 00

TASK NO. A5

MONITOR: AFOSR, XF
TR-92-0292, AFOSR

MONITOR: AFOSR, XF
TR-92-0268, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The following is a summary list of accomplishments under this contract: (1) ICAM was established in August of 1987. (2) An interactive computer system was developed. (3) Over 85 research papers were produced. (4) Over 33 students were supported in part by the contract. (5) More than 12 PhD's and 5 MS students were produced. (6) Seven Post Doctoral Associates were supported. (7) More than 65 short term visitors came to Virginia Tech (16 of these were long term visitors). (8) Over 100 scientists attended the conference on Numerical Methods for Partial Differential Equations.

DESCRIPTORS: (U) *NONLINEAR DIFFERENTIAL EQUATIONS,
*COMPUTATIONS, *MATHEMATICAL MODELS, COMPUTERS,
SCIENTISTS, STUDENTS, VIRGINIA, COMPUTER PROGRAMS,
AEROSPACE SYSTEMS.

IDENTIFIERS: (U) WUAFOSR612100, PE62301E.

ABSTRACT: (U) The research carried out during the period of the grant continued several lines of investigation on the way in which sensory and high-level influences contribute to the control of smooth and saccadic eye movements and on the perceptual implications of eye movements. We: (1) provided the first clear evidence that symbolic cues determine the direction of anticipatory smooth eye movements, showing that adaptive models, based on algorithms that modify pursuit according to prior performance cannot work; (2) showed that saccades to spatially-extended targets are best understood by a serial model, with a selection stage followed by a spatial pooling mechanism; (3) showed that slow control is a velocity, not a position, corrective and (4) showed that saccades (not shifts of attention) are required for accurate perception of poorly-segregating textures. These results are all consistent with the view that sensory and cognitive influences combine at a relatively high level of processing to provide a single, coherent input to the oculomotor system. Kowler also edited a book, published by Elsevier, containing major reviews and theoretical treatments of eye movements, vision and cognition.

DESCRIPTORS: (U) *EYE MOVEMENTS, *VISUAL PERCEPTION,
ALGORITHMS, COGNITION, CONTROL, EYE, GRANTS, INPUT,
MODELS, PROCESSING, SELECTION, TARGETS, TEXTURE, VELOCITY,

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VISION, SPACE PERCEPTION.

MASSACHUSETTS INST OF TECH CAMBRIDGE

IDENTIFIERS: (U) PE81102F, WUAFOSR2312A5, Saccadic eye movements.

(U) Microwave Propagation and Attenuation in Magnetoplasmas.

DESCRIPTIVE NOTE: Final rept. 1 Jun 90-30 Nov 91.

NOV 91 10P

PERSONAL AUTHORS: Lee, Min-Chang

CONTRACT NO. AFOSR-90-0263

PROJECT NO. 2301

TASK NO. ES

MONITOR: AFOSR, XF
TR-92-0275, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Under the sponsorship of the Air Force Office of Scientific Research Profs. Min-Chang Lee and Ronald R. Parker's research team has conducted experimental studies of anomalous absorption of radio waves in turbulent magnetized plasmas. This research program includes laboratory experiments with the newly constructed Versatile Toroidal Facility (VTF) at the MIT Plasma Fusion Center and the field experiments using orbiting satellites and ground-based radars at Arecibo, Puerto Rico. The design and construction of the Versatile Toroidal Facility involved five graduate students and twenty-two URGP (Undergraduate Research Opportunity Program) students. This student-oriented project was reported in the 1991 March 6 issue of the MIT Tech Talk. The detailed documentation and discussions of this VTF plasma device are presented in the M.S. theses of Robert F. Duraski (1991) and Chan Yoo (1991). Attached are the abstracts of these two graduate theses.

DESCRIPTORS: (U) *RADIOFREQUENCY INTERFERENCE,
*RADIATION ABSORPTION, *MAGNETOSPHERE, ARTIFICIAL
SATELLITES, GROUND BASED, MITES, PLASMA DEVICES, RADAR,
RADIO WAVES, PLASMAS(PHYSICS), TURBULENCE, ANOMALIES.

IDENTIFIERS: (U) Magnetized plasmas.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A250 181 12/1 12/3
 GEORGIA INST OF TECH ATLANTA SCHOOL OF PHYSICS
 (U) Transport-Collisional Master Equations for
 Termolecular Recombination as a Function of Gas
 Density.
 DESCRIPTORS: (U) *INTEGRAL EQUATIONS. *VARIATIONAL
 METHODS, DENSITY, ONE DIMENSIONAL, GASEOUS DIFFUSION
 SEPARATION, ANGULAR MOMENTUM, REPRINTS.
 IDENTIFIERS: (U) PE61102F, WUAFOSR2301A4, Termolecular
 recombination, Gas density.

DEC 91 24P

PERSONAL AUTHORS: Flannery, M. R.

REPORT NO. GIT-89-012

CONTRACT NO. AFOSR-89-0426

PROJECT NO. 2301

TASK NO. A4

MONITOR: AFOSR, XF
 TR-92-0317, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Chemical Physics, v95 n11
 p8205-8226, 1 Dec 91. Available to DTIC users only. No
 copies furnished by NTIS.

ABSTRACT: (U) Sets of transport-collisional master
 equations are developed for the microscopic distribution
 $n(R, E, L)$ of pairs over internal separation R , energy E ,
 and orbital angular momentum L of (A-B) pairs in a
 background gas M of variable density. Expressions are
 also provided for the rate of recombination of A and B as
 a function of gas density in transport and collisional
 forms which, respectively, involve microscopic
 probabilities for association of dissociated (A-B) pairs
 and probabilities for collisional stabilization of bound
 pairs. Analytical solutions for the pair distributions n
 and microscopic probabilities for recombination are
 obtained in the classical absorption limit. They pertain
 to exact (A-B) trajectories under general symmetric
 interaction $V(R)$ between A and B and are applied to ion-
 ion and electron-ion collisional recombination in a gas.
 A classical variational method is also presented. Useful
 expressions for the segments of hyperbolic and general
 trajectories enclosed by a sphere are derived in an
 Appendix.

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AD-A250 180 7/4 20/2 20/5 AD-A250 180 CONTINUED

PITTSBURGH UNIV PA SURFACE SCIENCE CENTER

(U) Direct Observation of Chemical Bond Dynamics on Surfaces,

Distribution) Method, Libration.

MAR 92 9P

PERSONAL AUTHORS: Yates, J. T., Jr.; Alvey, M. D.; Dresser, M. J.; Henderson, M. A.; Kiskinova, M.

CONTRACT NO. AFOSR-89-0364

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR, XF
TR-92-0339, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Science, v255 p1397-1403, 13 Mar 92.
Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) The dynamics of chemisorbed species as they swing to-and-fro on their adsorption sites may be directly observed with electron-stimulated desorption. The observation of the thermal disorder in adsorbate chemical bond directions, through studies of the thermal excitation of librational modes, allows one to visualize the potential energy surfaces controlling the structure and dynamics of adsorbates on single crystal metal and semiconductor surfaces. This information may be useful in understanding surface diffusion as well as the spatial aspects of surface chemical reactions. Electron stimulated desorption, dynamics, chemisorption, adsorption surface structure.

DESCRIPTORS: (U) *ADSORPTION, *CHEMICAL BONDS, *DESORPTION, *DYNAMICS, *OBSERVATION, *SINGLE CRYSTALS, *SURFACES, *ADSORBATES, *CHEMICAL REACTIONS, *CHEMICALS, *CHEMISORPTION, *CRYSTALS, *DIFFUSION, *ELECTRONS, *ENERGY, *EXCITATION, *METALS, *POTENTIAL ENERGY, *SEMICONDUCTORS, *SITES, *STRUCTURES, *REPRINTS, *ROTATION(CHEMICAL BONDS), *VIBRATION, *MOLECULES, *SOLIDS, *REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A2,
ESDIAD(Electron Stimulated Desorption Ion Angular

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AD-A250 179 PEG1102F, WUAFOSR2303A3.

AD-A250 179 20/3 20/12

MINNESOTA UNIV MINNEAPOLIS DEPT OF CHEMICAL ENGINEERING
AND MATERIALS SCIENCE

(U) TEM Analyses of Sol-Gel Derived and Sputtered PZT Thin
films,

90 8P

PERSONAL AUTHORS: Hsueh, Cheng-Chen; Mecartney, Martha L.

CONTRACT NO. F49620-89-C-0050

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR, XF
TR-92-0321, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Mat. Res. Soc. Symp. Proc., V200
p219-224, 1990. Available to DTIC users only. No copies
furnished by NTIS.

ABSTRACT: (U) Ferroelectric PZT thin films were prepared
by sol-gel methods and RF magnetron sputtering. Sputtered
PZT fast fired at 650 C for 30 minutes showed
microporosity. For the sol-gel route, solution precursors
had a significant effect on the microstructure of the
crystalline PZT films. PZT thin films derived from metal-
organic precursors dissolved in n-propanol were observed
to have large and microporous spherulitic grains on the
order of 2 um and phase separation in acetic acid-
catalyzed films. In contrast, PZT precursors originated in
from alcohol exchanges with 2-methoxyethanols resulted in
dense films with fine grains of ~0.2 um and clear
evidence of ferroelectric domains. The dense sol-gel
films possessed superior dielectric and ferroelectric
properties.

DESCRIPTORS: (U) *FERROELECTRIC DOMAINS, *THIN FILMS,
ACETIC ACID, ACIDS, ALCOHOLS, CONTRAST, DIELECTRICS,
EXCHANGE, FILMS, FINES, GELS, MAGNETRONS, METALS,
MICROSTRUCTURE, PHASE, PRECURSORS, PROPANOLS, SEPARATION,
SPUTTERING, REPRINTS.

IDENTIFIERS: (U) Sol-gel methods, PZT Thin films,

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OHIO STATE UNIV COLUMBUS

(U) Investigation of the Hepatotoxic and Immunotoxic Effects of the Peroxisome Proliferator Perfluorodecanoic Acid.

DESCRIPTORS: (U) *HYPERSENSITIVITY, *LYMPHOCYTES, *SPLEEN, *THYMUS, ACIDS, ANOREXIA, ATROPHY, CELLS, DAY, INJECTION, POPULATION, PRODUCTION, RESPONSE, WEIGHT.

IDENTIFIERS: (U) PE61102F, WUAFOSR2312AS, *Hypatoxicity, *Perfluorodecanoic acid, Immunotoxicity.

DESCRIPTIVE NOTE: Annual technical rept. 30 Apr 91-30 Apr 92.

APR 92 40P

PERSONAL AUTHORS: Tarr, Melinda J.; Mathes, Larry E.

CONTRACT NO. AFOSR-90-0371

PROJECT NO. 2312

TASK NO. AS

MONITOR: AFOSR, XF
TR-92-0406, AFOSK

UNCLASSIFIED REPORT

ABSTRACT: (U) These studies examine the immunotoxic effects 8 days and 30 days following an intraperitoneal injection of PFDA. Histologic alterations observed in lymphoid organs at 8 days following PFDA treatment were more severe than those apparent at 30 days following PFDA treatment. Relative thymus weight was decreased at both 8 and 30 days following PFDA treatment, whereas relative spleen weight was decreased only at 8 days following PFDA treatment. Proliferation in response to Con A in preliminary 30 day and in vitro PFDA studies was decreased. IgG2a production, but not IgA or IgM production was decreased at 8 but not 30 days following PFDA treatment. DTH response at 8 and 30 days after PFDA treatment tended to be suppressed, although these data were not statistically significantly different. NK activity was increased at 30 but not 8 days following PFDA treatment and appeared to be anorexia-associated. Preliminary data on IL-2R, and spleen and thymic cell populations have been collected. Initial experiments have begun on the effect of PFDA on induction of hepatic Enol CoA hydratase. Perfluorodecanoic acid; immunotoxic; thymic atrophy; lymphoproliferation; delayed-type hypersensitivity; NK cell activity; lymphocyte subsets; interleukin 2

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AD-A250 173 6/5 7/4

CORNELL UNIV ITHACA NY CENTER FOR APPLIED MATHEMATICS

TEXAS UNIV HEALTH SCIENCE CENTER AT SAN ANTONIO

(U) Symmetry Methods and Nonlinear Analysis in Elastomechanics.

(U) Investigation of Laser-Induced Retinal Damage.

DESCRIPTIVE NOTE: Final rept. 15 Oct 90-29 Nov 91.

DESCRIPTIVE NOTE: Annual rept. 1 Apr 91-31 Mar 92.

MAR 92 7P

APR 92 34P

PERSONAL AUTHORS: Healey, Timothy J.

PERSONAL AUTHORS: Glickman, Randolph D.; Lam, Kwok-Wai

CONTRACT NO. AFOSR-91-0062

CONTRACT NO. AFOSR-91-0208

PROJECT NO. 2304

PROJECT NO. 2312

TASK NO. A9

TASK NO. AS

MONITOR: AFOSR, XF

MONITOR: AFOSR, XF

TR-92-0370, AFOSR

TR-92-0316, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The essential goal of this investigation was to combine symmetry-reduction techniques with methods of nonlinear analysis to solve nonlinear differential equations associated with problems from elastomechanics. During the effective time of this grant papers have appeared and papers have been accepted for publication.

ABSTRACT: (U) Laser-induced, photooxidative damage in ocular tissue was studied with a quantitative assay using high performance liquid chromatography (HPLC) to separate oxidized and reduced ascorbic acid in exposed tissue components. We demonstrated that ascorbic acid, incubated with whole, bovine retinal pigment epithelial (RPE) cells, was oxidized when the reaction mixture was exposed to the output of an argon-ion continuous wave laser. The amount of ascorbic acid oxidized was proportional to the irradiance of the sample, and the reaction was wavelength-dependent, with short-wavelength visible light more effective than long-wavelengths in driving the reaction. The photosensitizing activity was associated with the RPE melanin pigment granules, and was not lost after disrupting or heating the RPE cells. Because melanin was known to form free radicals when illuminated, we hypothesized that ascorbic acid detoxified the light-activated melanin free radicals while being itself oxidized in process. If the supply of reduced ascorbic acid were exhausted, however, the activated melanin could have been source of tissue-damaging radicals. This model was consistent with a photochemical damage mechanism involving light-activated melanin.

DESCRIPTORS: (U) *NONLINEAR ANALYSIS, *NONLINEAR DIFFERENTIAL EQUATIONS, *ELASTIC PROPERTIES, DIFFERENTIAL EQUATIONS, EQUATIONS, REDUCTION, SYMMETRY, TIME, BIFURCATION(MATHEMATICS).

IDENTIFIERS: (U) Elastomechanics, PE61102F, WUAFOSR2304A9.

DESCRIPTORS: (U) *ASCORBIC ACID, *ANTIOXIDANTS, *RETINA, ACIDS, ARGON, BOVINES, CELLS, CONTINUOUS WAVE LASERS, CONTINUOUS WAVES, DAMAGE, FREE RADICALS, GRANULES,

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HEATING, IONS, LASERS, LIGHT, LIQUID CHROMATOGRAPHY, LONG
WAVELENGTHS, MELANIN, MIXTURES, MODELS, OUTPUT, PIGMENTS,
SHORT WAVELENGTHS, SUPPLIES, REPRINTS.

HARVARD UNIV CAMBRIDGE MA DEPT OF PSYCHOLOGY

(U) Forms of Memory for Representation of Visual Objects.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2312AS, *RPE(Retinal
Pigment Epithelial).

DESCRIPTIVE NOTE: Annual rept. 15 Feb 91-14 Feb 92,

FEB 92 8P

PERSONAL AUTHORS: Schacter, Daniel L.

CONTRACT NO. AFOSR-91-0182

PROJECT NO. 3484

TASK NO. HS

MONITOR: AFOSR, XF
TR-92-0234, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Considerable progress has been made during the past year toward achieving the project's main goals of elucidating the representations and processes involved in implicit and explicit memory for novel visual objects. Experiments have been completed or initiated that (a) clarify the effects of structural and functional encoding manipulations on priming and explicit memory, (b) help to specify the nature of the structural representation that underlies priming effects on the object decision task, (c) extend findings on priming of novel objects to tests other than possible/impossible object decision, (d) elucidate the extent to which implicit memory for novel objects is spared in subject populations with explicit memory deficits, and e) examine conditions under which priming of novel objects may be observed.

DESCRIPTORS: (U) *MEMORY(PSYCHOLOGY), CODING, POPULATION,
TEST AND EVALUATION.

IDENTIFIERS: (U) *Visual Objects, WUAFOSR3484HS,
PEG1103D.

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ROCHESTER UNIV NY

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(U) Function of P and M Pathways in Primates.

DESCRIPTIVE NOTE: Annual rept.,

APR 92 3P

PERSONAL AUTHORS: Merigan, William

CONTRACT NO. AFOSR-89-0041

PROJECT NO. 2313

TASK NO. A8

MONITOR: AFOSR, XF
TR-92-0310, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Psychophysical threshold measures were used in combination with precisely located lesions of the sub-cortical visual pathway to examine segregation of function between P and M pathways. Scleral search coils monitored fixation locus in the tested monkeys, to insure that test stimuli were presented in visual field regions corresponding to the lesion location. Results of these studies indicated that the P pathway (or color-opponent pathway) is the major contributor to visual acuity, color vision, and luminance contrast sensitivity. On the other hand, the M pathway (or broadband pathway) appeared crucial for the visibility of low spatial frequencies (broad contours), as well as sensitivity to rapidly drifting visual stimuli.

DESCRIPTORS: (U) *COLOR VISION, *LESIONS, *SENSITIVITY, *STIMULI, ACUITY, BROADBAND, COILS, COLORS, CONTRAST, FUNCTIONS, HANDS, LOCUS, LUMINANCE, MONKEYS, REGIONS, TEST AND EVALUATION, VISIBILITY, VISION, VISUAL ACUITY.

IDENTIFIERS: (U) WUAFOSR2313A8, PE61102F.

(U) Structure of an Unusual Octacyclic Cage Compound.

90 4P

PERSONAL AUTHORS: Watson, William H.; Kashyap, Ram P.; Marchand, Alan P.; Ngooi, Teng-Ko

CONTRACT NO. F49620-89-C-0050

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR, XF
TR-92-0338, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Acta Cryst. VC46 p2189-2191 1990.
Available only to DTIC users. No copies furnished by NTIS.

Reprint: Structure of an Unusual Octacyclic Cage Compound.
DESCRIPTORS: (U) *CRYSTAL STRUCTURE, X RAY SPECTROSCOPY, POLYCYCLIC COMPOUNDS, REPRINTS.

IDENTIFIERS: (U) WUAFOSR2303A3, PE61102, *Octacyclic cage compounds, Cage compounds, *X Ray crystal structure.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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electron microscopy, Die coating, Slot coating, Extension.

MINNESOTA UNIV MINNEAPOLIS DEPT OF CHEMICAL ENGINEERING
AND MATERIALS SCIENCE

(U) Rheology for Better Sol-Gel Fiber and Film Formation,

90 16P

PERSONAL AUTHORS: Macosko, C. W.; McCartney, M. L.;
Scriven, L. E.

CONTRACT NO. F49620-89-C-0050

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR, XF
TR-92-0322, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Mat. Res. Soc. Symp. Proc., v180
p555-568 1990. Available only to DTIC users. No copies
furnished by NTIS.

ABSTRACT: (U) Flow behavior of a liquid or suspension
depends on how stress varies with strain rate, strain-
rate rotation, and strain history, as well as the
progress of evaporation, extent of reaction, and degree
of aggregation in sol-gel systems. Rheological methods
suitable for measuring flow behavior are summarized.
Examples of measurements and microstructural observations
by transmission electron microscopy made during gelation
of four sol-gel systems are presented. The relation of
rheological response to microstructure is discussed.

DESCRIPTORS: (U) *FLOW, *GELS, *RHEOLOGY, *FILMS,
BEHAVIOR, ELECTRON MICROSCOPY, ELECTRONS, EVAPORATION,
GELATION, HISTORY, LIQUIDS, MEASUREMENT, MICROSCOPY,
MICROSTRUCTURE, RATES, RESPONSE, ROTATION, STRAIN RATE,
REPRINTS, STRESS STRAIN RELATIONS, CHEMICAL REACTIONS,
COATINGS, DEPOSITION, SUBSTRATES, SPINNING(INDUSTRIAL
PROCESSES), SOLIDIFICATION, SHEAR PROPERTIES,
THERMODYNAMIC PROPERTIES.

IDENTIFIERS: (U) WUAFOSR2303A3, PE61102, *Sol-Gel fibers,
*Film formation, Suspensions, Aggregation, Transmission

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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AD-A250 051 7/2 7/4 20/4 20/6
MINNESOTA UNIV MINNEAPOLIS DEPT OF CHEMICAL ENGINEERING
AND MATERIALS SCIENCE

(U) Vanadium Pentoxide Gels: Structural Development and
Rheological Properties,

90 8P

PERSONAL AUTHORS: Bailey, J. K.; Nagase, T.; Pozarnsky, G.
A.; Mecartney, M. L.

CONTRACT NO. F49620-89-C-0050

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR, XF
TR-92-0320, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Mat. Res. Soc. Symp. Proc., v180
p759-764. Available only to DTIC users. No copies
furnished by NTIS.

ABSTRACT: (U) Cryogenic transmission electron microscopy (cryo-TEM) and rheological characterization were conducted in order to understand structural development of vanadium pentoxide gels during processing. Sols were prepared by ion exchange from sodium metavanadate solutions. CryoTEM revealed that fine threads about 1.5nm wide initially form and grow into ribbons approximately 25nm wide and at least 1000nm long. The threads appear to self assemble into the ribbons. During this structural development, the dynamic viscosity increased. Upon steady shearing of the sols, the system exhibited thixotropy, i.e. the viscosity decreased with time under constant shear stress and subsequently rheopexy, the viscosity increased with time. Comparison of the structure before and after shearing indicated that during the rheological experiments aggregation of small particles or fragments was occurring.

DESCRIPTORS: (U) *GELS, *VANADIUM, *RHEOLOGY, COMPARISON, CONSTANTS, CRYOGENICS, DYNAMICS, ELECTRONS, EXCHANGE, FINES, FRAGMENTS, ION EXCHANGE, IONS, PARTICLES, PROCESSING, SODIUM, STRUCTURES, TIME, VISCOSITY, REPRINTS.

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DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T85005

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MINNESOTA UNIV MINNEAPOLIS DEPT OF CHEMICAL ENGINEERING
AND MATERIALS SCIENCE(U) Microstructural Development and Electrical Properties
of Sol-Gel Prepared Lead Zirconate-Titanate Thin Films.

OCT 91

12P

PERSONAL AUTHORS: Hsueh, Cheng-Chen; Mecartney, Martha L.

CONTRACT NO. F49620-89-C-0050

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR, XF
TR-92-0319, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Materials Research, v6 n10
p1-10 Oct 91. Available only to DTIC users. No copies
furnished by NTIS; Document partially illegible.Reprint: Microstructural Development and Electrical
Properties of Sol-Gel Prepared Lead Zirconate-Titanate
Thin Films.DESCRIPTORS: (U) *FERROELECTRIC MATERIALS,
*MICROSTRUCTURE, *THIN FILMS, PRECURSORS, NUCLEATION,
CRYSTALLOGRAPHY, LEAD TITANATES, REPRINTS.IDENTIFIERS: (U) *Lead zirconate titanate, Sol-gel
preparation..

AD-A250 028

9/3

NEW MEXICO UNIV ALBUQUERQUE CENTER FOR HIGH TECHNOLOGY
MATERIALS

(U) Laser Material Interactions.

DESCRIPTIVE NOTE: Annual technical rept. for period
ending 15 Apr 91.

APR 92

36P

PERSONAL AUTHORS: Brueck, S. R.

CONTRACT NO. AFOSR-89-0337

PROJECT NO. 2301

TASK NO. AS

MONITOR: AFOSR, XF
TR-92-0312, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The Laser-Materials Interaction Laboratory
at the Center for High Technology Materials at the
University of New Mexico, which is devoted to a broad
range of laser spectroscopic probes of semiconductor and
nonlinear materials, fabrication processes, and
optoelectronic devices, carries out much of this work in
conjunction with the Optoelectronics Research Center
Program, also funded by AFOSR. During the period of this
report significant progress was made in a number of areas,
including ultrafast operation of optically-pumped
resonant periodic-gain GaAs surface-emitting lasers,
grating coupling to surface-plasma waves, and high-speed
Si Schottky photodiodes.DESCRIPTORS: (U) *LASER MATERIALS, *GALLIUM ARSENIDE
LASERS, *SCHOTTKY BARRIER DEVICES, COUPLINGS, FABRICATION,
GAIN, INTERACTIONS, NUMBERS, OPERATION, PHOTODIODES,
PLASMA WAVES, PROBES, SEMICONDUCTORS, SURFACES, VELOCITY,
SILICON.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2301AS.

AD-A250 050

AD-A250 028

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A250 023 CONTINUED

AD-A250 023 22/3

FLORIDA ATLANTIC UNIV BOCA RATON CENTER FOR APPLIED
STOCHASTICS RESEARCH

(U) Nonlinear Sloshing and the Coupled Dynamics of Liquid
Propellants and Spacecraft.

DESCRIPTORS: (U) *LIQUID PROPELLANTS, *SPACECRAFT,
AMPLITUDE, BAFFLES, CONTROL, COUPLINGS, DRAINAGE,
DYNAMICS, ENVIRONMENTS, FEEDBACK, FLUID DYNAMICS, FLUIDS,
GRAVITY, IMPACT, LIQUIDS, MISSIONS, MOTION, PROPELLANTS,
REQUIREMENTS, SIMULATION, SLOSHING, SPACE BASED, 3 DRAGE,
THREE DIMENSIONAL.

DESCRIPTIVE NOTE: Final rept. 1 Oct 89-31 Dec 91,

IDENTIFIERS: (U) PE61102F, WUAFOSR2302B1.

FEB 92 84P

PERSONAL AUTHORS: Su, Tsung-Chow

CONTRACT NO. AFOSR-89-0444

PROJECT NO. 2302

TASK NO. B1

MONITOR: AFOSR, XF
TR-92-0229, AFOSR

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Availability: Document partially
illegible.

ABSTRACT: (U) Current and future space-based systems
have rather complex mission requirements which demand the
storage of large amounts of liquid propellants on board.
With large controller bandwidths and rapid maneuvering of
the spacecraft in a low gravity environment, potential
coupling between the sloshing liquid, the spacecraft
motion and structural modes need to be carefully
evaluated to ensure the system design adequacy. For
achieving the mission success, the first important step
is to understand the nonlinear dynamics of the liquid
sloshing. The report summarizes a two-year study on the
development and application of the numerical method for
three-dimensional liquid sloshing simulation. Fluid
dynamics and fluid loading, including total force and
impact for the vessel undergoing rapid movement were
simulated. Effects of baffles and active baffles with or
without feedback mechanism for sloshing control were
compared. It was found that moving baffles can be very
effective in suppressing large amplitude sloshing.
Complicated swirling intensification by drainage was also
numerically simulated. Sloshing, Breaking wave, VOF
method, active control

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AD-A249 986 20/6 9/3

AD-A249 916 11/6 7/4

SPIE-THE INTERNATIONAL SOCIETY FOR OPTICAL ENGINEERING
BELLINGHAM WA

ISRAEL INST OF METALS HAIFA

(U) Sol-Gel Optics: Proceedings SPIE-The International
Society for Optical Engineering Held in San Diego,
California on 11-13 July 1990. Volume 1328.(U) Laser Induced Reaction for Pre-Bond Surface
Preparation of Aluminum Alloys.

DESCRIPTIVE NOTE: Annual rept. MAR 91-Mar 92.

DESCRIPTIVE NOTE: Final rept. 1 Jul 90-30 Jun 91.

MAR 92 38P

MAR 92 512P

PERSONAL AUTHORS: Mackenzie, John D.; Ulrich, Donald R.
Dodiuk, H.

PERSONAL AUTHORS: Rotel, M.; Zahavi, J.; Buchman, A.;

CONTRACT NO. AFOSR-90-0295

REPORT NO. 524-679

PROJECT NO. 2303

CONTRACT NO. AFOSR-91-0148

TASK NO. A3

PROJECT NO. 2301

MONITOR: AFOSR, XF

TASK NO. DA

TR-92-0254, AFOSR

MONITOR: AFOSR, EOARD
91-0148, TR-92-07

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: For sales information of individual
items, see AD-P006 408 thru AD-P008 450.ABSTRACT: (U) This conference produced the first
proceedings on sol-gel optics. The proceedings include
reports on the attempts to fabricate semiconductor-in-
glass quantum-well confinement lenses. The successful
preparation of organic dyes-in-oxides laser elements is
discussed, as well as research on the fabrication of
grooved glass discs through the mechanical patterning of
the soft gels.DESCRIPTORS: (U) *GLASS LASERS, *OPTICS, *SEMICONDUCTORS,
DYES, FABRICATION, GELS, GLASS, LASERS, LENSES, OXIDES,
PREPARATION, TRANSITION METALS, SYMPOSIA.IDENTIFIERS: (U) PE81102F, WUAFOSR2303A3, *Sol gel
optics, Component Report.ABSTRACT: (U) Irradiation of Al alloy 2024/T3 with
excimer laser was carried out at various experimental
conditions (laser energy and number of pulses). Surface
analysis of the treated alloy was carried out by FTIR,
SEM and AUGER. The laser treated metal adherends were
bonded with rubber modified epoxy adhesive, and the
resultant shear strength (SLS) was measured. Fracture
surfaces were analysed by SEM. The results show clearly
that laser prebond treatment of the neat adherend's
surface improved significantly the adhesion strength.
Improvement of 600% of the adhesion shear strength was
achieved with laser energy of about 0.2 J/P/cm² compared
to the adhesion strength of untreated neat Al alloy. The
value of the adhesion strength after optimal laser
treatment even exceeds that of conventional unsealed
chromic anodized treatment. Pre-bonding of Al, Excimer,
surface treatment.DESCRIPTORS: (U) *SURFACE ANALYSIS, *ALUMINUM ALLOYS,
ADHESION, ADHESIVES, ALLOYS, AUGERS, BONDING, ENERGY,
EXCIMERS, IRRADIATION, LASERS, METALS, NUMBERS, RUBBER,
SHEAR STRENGTH, SURFACES, VALUE.

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AD-A249 916 CONTINUED

AD-A249 830 6/4 23/2

IDENTIFIERS: (U) PE61102F, WUAFOSR2301DA, Laser induced reactions.

MARYLAND UNIV COLLEGE PARK OFFICE OF RESEARCH ADMINISTRATION AND ADVANCEMENT

IAC NO. PL-056429

(U) Coordinated Action in 3-D Space.

IAC DOCUMENT TYPE: PLASTIC - MICROFICHE --

DESCRIPTIVE NOTE: Annual interim rept. 15 Dec 90-14 Jan 92.

IAC SUBJECT TERMS: P--(U)LASER EFFECTS, SURFACE PREPARATION, ADHESIVE BONDING, IRRADIATION, ALUMINUM, FOURIER TRANSFORM IR, AUGER SPECTROSCOPY, SHEAR, RUBBER MODIFIED EPOXY, SPECTROSCOPY, SEM, EPOXY ADHESIVES, FRACTURE SURFACE, ANODIZED SURFACES, PROCESS COMPARISONS, ACID ETCHING, LAP SHEAR, JOINT STRENGTH, FAILURE MODES, WEDGE TESTS, BONDING, ZZ UNLIMITED.

MAR 92 4P

PERSONAL AUTHORS: Stinman, Robert M.

CONTRACT NO. AFOSR-91-0124

PROJECT NO. 2313

TASK NO. CS

MONITOR: AFOSR, XF
TR-92-0233, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This grant (1): tests alternative hypotheses about mechanisms controlling gaze-shifts while manipulating nearby objects, viz., on-line feedback vs. learned, preplanned coordinated movements and (2) studies speed and accuracy of visually-guided arm movements. Work this year concentrated primarily on instrumentation, i.e., (1) a SUN workstation was procured and configured, (2) an interface between the Maryland RFM and a PC was constructed. This allowed old DEC computers to be retired, (3) a hands-on, calibrated workspace was constructed and (4) software for data acquisition and analysis was developed. Progress was made with more intellectual activities while this new instrumentation was developed, viz., (1) a behavioral trigonometric technique was worked out for estimating the eyes' centers of rotation with the head free to move, (2) slow control was shown to be sensitive only to velocity and not to position (contrary to prior claims), (3) Pizio completed a Ph.D thesis on shape constancy by human beings and computers, and (4) it was shown that unspaced word-texts could be read out-loud easily. This provocative finding makes great difficulties for all contemporary theories of reading because they assume that spaces in texts are required to parse words effectively. eye-hand coordination, saccades, slow control, reading.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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AD-A249 199 20/6

YALE UNIV NEW HAVEN CT DEPT OF APPLIED PHYSICS

DESCRIPTORS: (U) *VISUAL PERCEPTION, *HUMAN FACTORS
ENGINEERING, ACCURACY, ACQUISITION, CONTROL, DATA
ACQUISITION, EYE, FEEDBACK, HANDS, HEAD(ANATOMY), HUMANS,
HYPOTHESES, INSTRUMENTATION, INTERFACES, READING,
ROTATION, SHAPE, TEST AND EVALUATION, VELOCITY, COMPUTER
APPLICATIONS.

(U) Frequency Splitting of Degenerate Spherical Cavity
Modes: Stimulated Raman Scattering Spectrum of
Deformed Droplets.

91 4P

IDENTIFIERS: (U) PE61102F, WUAFOSR2313CS, Hand eye
coordination, Saccades.

PERSONAL AUTHORS: Chen, Gang; Chang, Richard K.; Hill,
Steven C.; Barber, Peter W.

CONTRACT NO. AFOSR-S1-0150

PROJECT NO. 2308

TASK NO. CS

MONITOR: AFOSR, XF
TR-92-0248, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Optics Letters, v16 n16 p1269-1271
1991. Available only to DTIC users. No copies furnished
by NTIS.

ABSTRACT: (U) High-resolution interferometric spectra of
the stimulated Raman scattering (SRS) spectra from
flowing ethanol droplets are presented. The linewidths of
the SRS peaks are less than 0.005 cm⁻¹ and the equal
frequency spacings of the SRS peaks are an order of
magnitude smaller than the spacings for morphology-
dependent resonances (MDR's) of a perfect sphere. The
observed results from droplets which are deformed by
inertial effects are consistent with T-matrix and
perturbation predictions of frequency splitting into the
various azimuthal modes of a (2n + 1)-degenerate MDR with
angular momentum n in a perfect sphere.

DESCRIPTORS: (U) *SCATTERING, ANGULAR MOMENTUM, ETHANOLS,
HIGH RESOLUTION, PERT, SPHERES, REPRINTS.

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YALE UNIV NEW HAVEN CT DEPT OF APPLIED PHYSICS

AD-A249 106 11/2 7/4 11/6

PENNSYLVANIA STATE UNIV UNIVERSITY PARK

(U) Nonlinear Optical Processes in Droplets with Single-Mode Excitation.

(U) Processing and Properties of Chemically Derived Calcium Silicate Cements.

91

28P

DESCRIPTIVE NOTE: Final rept. 1 Apr 88-31 Aug 91,

PERSONAL AUTHORS: Chang, Richard K.; Chen, Gang; Hill, Steven C.; Barber, Peter W.

FEB 92 87P

PERSONAL AUTHORS: Scheetz, B. E.; Mecholsky, J. J.; Adair, J. H.

CONTRACT NO. AFOSR-91-0150

PROJECT NO. 2308

CONTRACT NO. AFOSR-88-0184

TASK NO. CS

PROJECT NO. 2306

MONITOR: AFOSR, XF
TR-92-0247, AFOSR

TASK NO. A2

MONITOR: AFOSR, XF
TR-92-0223, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

Availability: Pub. Nonlinear Optics and Materials, v1497, 8-10 May 91. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) Several nonlinear optical processes concurrently occur in single micrometer-sized droplets that are irradiated by the second-harmonic output of a single-mode Q-switched Nd:YAG laser. We review the following observations of stimulated Brillouin scattering (SBS) and stimulated Raman scattering (SRS) in droplets: (1) the image of the droplets that are emitting SRS and SRS; (2) the long delay and decay time of the SRS pulse; (3) the correlated temporal profiles of SRS and SRS pulses; (4) the high-resolution spectra of SRS; (5) the frequency splitting of a degenerate spherical normal mode in the SRS spectra; and (6) the fine structures in the angular distribution of SRS. Stimulated Raman Scattering, Stimulated Brillouin Scattering Droplets, Nonlinear optical Effects, High Intensity laser -interactions, angular distribution, frequency splitting.

DESCRIPTORS: (U) *SCATTERING, *OPTICS, HARMONICS, HIGH INTENSITY, IMAGES, LASERS, MICROMETERS, REPRINTS.

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ABSTRACT: (U) Chemical engineering approach has been employed to promote elimination of large size flaws and improve strength. A general philosophy in the program was to prepare advanced cements designated as chemically bonded ceramics and use fracture mechanics and fractography to determine the size and origin of the critical flaw. Flaws of a certain type were eliminated in subsequent materials by alteration in some stage of the processing scheme. One of the most important goals of the current program was to analyze the effectiveness of indentation techniques for evaluating the mechanical properties of cementitious materials. The indentation-strength technique was found applicable to MDF cements for measuring fracture toughness. The indentation-strength technique and fracture surface analysis were found applicable to MDF cements for measuring fracture toughness. By using both optical and electron microscopes, fractograph becomes a powerful tool to estimate the toughness. Therefore we suggest the small crack techniques are applicable for the measurement of crack growth resistance in cementitious materials as long as the crack size is that a characteristic dimension of the microstructure.

DESCRIPTORS: (U) *CEMENTS, CHEMICAL ENGINEERING, CRACKS,

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T85005

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ELECTRON MICROSCOPES, ELECTRONS, MECHANICAL PROPERTIES, SURFACE ANALYSIS, TOOLS, STRENGTH(GENERAL), FRACTURE(MECHANICS), TOUGHNESS, CALCIUM ALLOYS, CERAMIC MATERIALS, FRACTOGRAPHY, ALKALINE EARTH METALS, POWDER METALLURGY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2306A2, *Chemically bonded ceramics, *Calcium silicates cements, Indentation technique, Flows, MDF(Macro-Defect-Cree), Unhydrated grains, Hydrothermal methods, MOD(Metal Organic Decanposition).

AD-A249 023 7/2 11/6 20/11

SOUTHWEST RESEARCH INST SAN ANTONIO TX

(U) Crack Growth Processes at Elevated Temperatures in Advanced Materials.

DESCRIPTIVE NOTE: Annual rept. 1 Jan 91-1 Jan 92.

FEB 92 251P

PERSONAL AUTHORS: Davidson, David L.; Chan, Kwai S.; Lankford, James

REPORT NO. SWR106-2699/3

CONTRACT NO. F49620-89-C-0032

PROJECT NO. 2306

TASK NO. AS

MONITOR: AFOSR, XF
TR-92-0241, AFOSR

UNCLASSIFIED REPORT

Availability: Document partially illegible.

SUPPLEMENTARY NOTE: Original contains color plates: All DTIC and NTIS reproductions will be in black and white.

ABSTRACT: (U) Research in this program during the past 3 years has fracture studies on intermetallic alloys. Most of the work was focused on alloys based on the intermetallic compounds Ti3Al and TiAl, but some work to characterize alloys based on Nb3Al was also accomplished. The mechanisms controlling fatigue and fracture toughness of these new materials have been determined and compared to similar knowledge for other alloys. For a TiAl alloy with lamellar microstructure, fatigue cracks grew 10 times slower at 800 degrees C in vacuum, and the threshold for the crack growth was higher than for 25 degrees C in air. Growth was intermittent and crack tip opening alternated between blunt and sharp, just as found for other alloys. Crack growth was influenced by the direction of the lamellae relative to the loading axis, especially at low stresses. For crack growth perpendicular to the lamella direction, crack advance was linked to the width of the lamellae. Fatigue crack

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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closure was about the same as for other alloys. Because of the similarity of crack growth behavior between this and other titanium alloys, a crack tip geometric model previously used for other materials was applied.

DESCRIPTORS: (U) *ALLOYS, *CRACKS, *FATIGUE, *MATERIALS, *TITANIUM ALLOYS, *TOUGHNESS, *FRACTURE(MECHANICS), *HIGH TEMPERATURE, *NIOBIUM ALLOYS, AIR, ALUMINIDES, BEHAVIOR, CLOSURES, INTERMETALLIC COMPOUNDS, MICROSTRUCTURE, MODELS, OPENINGS, STRESSES, TITANIUM, TITANIUM ALUMINIDE, VACUUM, WIDTH.

IDENTIFIERS: (U) Titanium aluminate alloy, Fatigue crack growth, Fracture toughness, PE61102F, ASAFOSR2306AS, Lamellar microstructures.

AD-A248 992 8/7 19/9

UTD INC NEWINGTON VA

(U) Investigation of the Interface Phenomena Due to Interaction of High Intensity Stress Waves with Geologic Boundaries.

DESCRIPTIVE NOTE: Final rept. 1 Nov 90-30 Nov 91.

NOV 91 35P

PERSONAL AUTHORS: Amini, Ali; Majtenyi, Steven I.

REPORT NO. OSR-9008

CONTRACT NO. F49620-91-C-0008

PROJECT NO. 2302

TASK NO. CS

MONITOR: AFOSR, XF
TR-92-0235, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) During the reporting period a stress-strain relationship was derived for the study of the interface phenomena when a high intensity stress wave impinges on a geologic boundary. The derived relationship was based on the ultimate density concept, i.e., the density of the material increases non-linearly with increasing stresses approaching a limiting value before a polymorphic phase transformation occurs. The derived stress-strain relationship was compared with high pressure data for three rock types. Based on this comparison it was determined that the derived stress-strain relationship modeled material behavior accurately with realistic physical parameters. The relationship was then used in the solution of second order non-linear Partial Differential Equations (PDE) of motion. The method of similarity was used to transform the non-linear PDE to an Ordinary Differential Equation (ODE). The ODE was then solved by standard techniques. The result was a closed form equation for particle displacement profiles in space and time domains including particle velocity acceleration and stress profiles. These profiles will be used in upcoming tasks to determine the role of various parameters in the generation of new waves at interfaces

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with mediums of finite thickness and the response at interfaces which can be described by a half-space.

DESCRIPTORS: (U) *STRESS WAVES, *SEISMIC WAVES, *SOILS, ACCELERATION, BEHAVIOR, BOUNDARIES, COMPARISON, DENSITY, DISPLACEMENT, EQUATIONS, HIGH INTENSITY, HIGH PRESSURE, INTENSITY, INTERFACES, MATERIALS, MOTION, PARAMETERS, PARTICLES, PHASE, PHASE TRANSFORMATIONS, PRESSURE, PROFILES, RESPONSE, ROCK, STANDARDS, STRESSES, THICKNESS, TIME, TRANSFORMATIONS, VALUE, VELOCITY, WAVES, STRESS STRAIN RELATIONS, WAVE PROPAGATION, UNDERGROUND EXPLOSIONS, SHOCK WAVES, GEOLOGY.

IDENTIFIERS: (U) WJAFOSR2302CS.

AD-A248 903 11/2 11/4

ROCKWELL INTERNATIONAL THOUSAND OAKS CA SCIENCE CENTER

(U) Transformation Toughening of Ceramics.

DESCRIPTIVE NOTE: Final rept. 15 Jan 89-14 Jan 92.

MAR 92 150P

PERSONAL AUTHORS: Marshall, D. B.

REPORT NO. SC71002.FR

CONTRACT NO. F49620-89-C-0031

PROJECT NO. 2306

TASK NO. A2

MONITOR: AFOSR, XF
TR-92-0236, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The results of a three-year study, aimed at developing a fundamental understanding of transformation toughening in ceramics and using that understanding to design and fabricate new microstructures with improved properties, are described. A new class of materials with dual scale (laminar) microstructures and greatly enhanced fracture toughness have been developed and tested; Increases in fracture toughness from 5 to 18 MPa (to the 1/2 power) were measured. These new microstructures were designed by combining micromechanics modeling of the effects of zone shape on toughness with direct measurements of transformation zone characteristics (which provided critical testing of the theoretical modeling) and measurements of transformation thermodynamics. To fabricate these microstructures a novel colloidal processing method, which allowed construction of multilayered structures with layer thicknesses as small as 10 microns, was developed. The direct transformation zone measurements included Raman microprobe spectroscopy to measure the distribution of transformed phases within the zones, and moire interferometry and high resolution strain mapping (by digital image correlation) to measure directly the transformation strains that are responsible for toughening. Calculations of crack tip shielding indicated

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DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T85005

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modifications to transformation zone shapes that would increase the toughening.

DESCRIPTORS: (U) *MECHANICAL PROPERTIES, *CERAMIC MATERIALS, *LAMINATES, BEHAVIOR, CONSTRUCTION, CRACKS, DISTRIBUTION, HIGH RESOLUTION, IMAGES, INTERFEROMETRY, LAYERS, MECHANICS, MICROPROBES, PROCESSING, REGIONS, RESOLUTION, SHAPE, SHIELDING, SPECTROSCOPY, STRUCTURES, THERMODYNAMICS, TOUGHNESS, TRANSFORMATIONS, MICROSTRUCTURE, FATIGUE(MECHANICS), FRACTURE(MECHANICS), STRAIN(MECHANICS), COMPOSITE MATERIALS, FABRICATION, ZIRCONIUM.

IDENTIFIERS: (U) WUAFOSR2308A2, PEB1102F, Micromechanics, Crack tips.

PENNSYLVANIA UNIV PHILADELPHIA

(U) Scene Segmentation and Reasoning under Uncertainty.

DESCRIPTIVE NOTE: Final rept. 1 Aug 88-30 Sep 91.

SEP 91 3P

PERSONAL AUTHORS: Bajcsy, Ruzena

CONTRACT NO. AFOSR-88-0244

PROJECT NO. 2304

TASK NO. A7

MONITOR: AFOSR, XF
TR-92-0148, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Segmentation of range images has long been considered in computer vision as an important but extremely difficult problem. A new paradigm for the segmentation of range images into piecewise continuous patches is presented. Data aggregation is performed via model recovery in terms of variable-order bi-variate polynomials using iterative regression. All the recovered models are potential candidates for the final description of the data. Selection of the models is achieved through a maximization of quadratic Boolean problem. The procedure can be adapted to prefer certain kinds of descriptions (one which describes more data points, or has smaller error, or has lower order model). They have developed a fast optimization procedure for model selection. The major novelty of the approach is in combining model extraction and model selection in a dynamic way. Partial recovery of the models is followed by the optimization (selection) procedure where only the best models are allowed to develop further. The results obtained in this way are comparable with the results obtained when using the selection module only after all the models are fully recovered, while the computational complexity is significantly reduced. The procedure was tested on several real range images.

DESCRIPTORS: (U) *COMPUTER VISION, *IMAGES, APPROACH, ERRORS, EXTRACTION MODELS, OPTIMIZATION, POLYNOMIALS.

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RECOVERY, VARIABLES, RANGE(DISTANCE).

BOSTON UNIV MA DEPT OF MATHEMATICS

IDENTIFIERS: (U) *Segmentation, Data aggregation, Scene analysis.

(U) Mathematical Models of Non-Linear Mechanical and Electrical Systems and Their Qualitative Behavior.

DESCRIPTIVE NOTE: Final rept. 15 Jul-14 Oct 91,

OCT 91 4P

PERSONAL AUTHORS: Levi, Mark

CONTRACT NO. AFOSR-91-0296

PROJECT NO. 2304

TASK NO. A4

MONITOR: AFOSR, XF
TR-92-0228, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) A series of numerical experiments which were carried out with Michael Henderson at IBM (Yorktown) uncovered a very puzzling phenomenon of phase repulsion. This effect consists of the following: when two (identical) oscillators interact, their phases actually repel: one oscillator wants to be slightly ahead or slightly behind the other; this happens despite the apparently synchronizing effect of the coupling. This phase-repulsion phenomenon was totally unexpected and a full explanation remains to be given. The PI did provide an explanation in a simple case, based on estimates (he would like to find a more universal explanation of this apparently basic effect.) The PI expects phase repulsion to play an interesting role in large networks of coupled oscillators.

DESCRIPTORS: (U) *OSCILLATORS, *PHASE STUDIES,
*MATHEMATICAL MODELS, *INTERACTIONS, *REJECTION,
COUPLINGS, NETWORKS, PHASE, RECREATION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A4.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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STANFORD UNIV CA DEPT OF MECHANICAL ENGINEERING

(U) The Effects of Free Stream Turbulence and Surface Curvature on Boundary Layer Flow and Heat Transfer.

DESCRIPTIVE NOTE: Final rept. 1 Jan 89-31 Dec 90.

MAR 92 17P

PERSONAL AUTHORS: Bradshaw, P.; Johnson, J. P.; Moffat, R. J.

CONTRACT NO. AFOSR-89-0246

PROJECT NO. 2307

TASK NO. CS

MONITOR: AFOSR. XF
TR-92-0258, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The effects of grid-generated, free-stream turbulence up to levels of 7.5% were investigated in a low speed water channel. The distribution of turbulent Prandtl number in the flat-wall region was found to be the same in water as in air, contrary to expectations based on the literature. The effect of Prandtl number on wall trace visualizations of heat transfer was investigated with a liquid crystal surface in a water tunnel. Heat transfer images were dominated by events within the sublayer, fluid mechanics visualizations show effects from far out in the boundary layer. A series of experiments were done in a high turbulence air tunnel (18% uniform across the tunnel) to investigate whether or not an abrupt change in flow passage size, with no flow acceleration, would affect heat transfer. A membrane was placed at 1/3 and 1/6 of the passage height in a heat transfer tunnel, reducing the largest possible normal scale of the turbulence by that same ratio. There was no significant change in the distribution of heat transfer on the surface under the membrane. A second investigation involved wake-like turbulence interacting with turbulent boundary layers. A wind tunnel experiment is described where spatially-inhomogeneous turbulence, in the absence of mean-velocity variations, is generated by a graded grid which produces intensity levels of 10% at its top

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and hardly any at its bottom, the part close to a flat wall. Turbulence from the grid diffuses down the intensity gradient and spreads into a turbulent boundary layer on the flat wall.

DESCRIPTORS: (U) *FREE STREAM, *TURBULENT BOUNDARY LAYER, ACCELERATION, AIR, CHANNELS, DISTRIBUTION, FLUID MECHANICS, GRADIENTS, GRIDS, HEAT, HEAT TRANSFER, HEIGHT, IMAGES, INTENSITY, LAYERS, LIQUID CRYSTALS, MEAN, MEMBRANES, PRANDTL NUMBER, RATIOS, REGIONS, SCALE, TURBULENCE, VARIATIONS, VELOCITY, WAKE, WALLS, WATER TUNNELS, WIND TUNNELS.

IDENTIFIERS: (U) WUAFOSR2307CS.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A248 838

20/5

SOUTHAMPTON UNIV (UNITED KINGDOM) DEPT OF CHEMISTRY

(U) Chemielelectron and Photoelectron Spectroscopic Studies
of Importance in the Upper Atmosphere.

DESCRIPTIVE NOTE: Final rept. 1 Mar 89-31 Dec 91,

FEB 92 9P

PERSONAL AUTHORS: Dyke, J. M.

CONTRACT NO. AFDSR-89-0351

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR, XF
TR-92-0255, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Chemielelectron spectroscopy has been used to study the associative and rearrangement ionization reactions of a number of metals with O, O₂(X 3g -) and O₂(a1 A g) and other atmospheric species. The spectra obtained have been used to identify the main chemiionization channel and to obtain details of the potential surfaces of the reactants and products. Mass spectra, recorded as a function of extraction potential, have also been used to identify primary ions associated with chemiionization reactions. The chemiionization reactions of oxygen atoms with a number of hydrocarbons have also been studied by chemielelectron spectroscopy. Photoelectron spectroscopy has also been used to study in the gas phase the electronic structure of a number of metals and metal oxides which are of importance in the upper atmosphere. Multiphoton spectroscopic studies have also been performed on a number of reactive intermediates. Chemielelectron spectroscopy, Ionic heats of formation, Photoelectron spectroscopy, Charge exchange reactions, Ionization energies, Chemiionization, Chemiion mass spectrometry.

DESCRIPTORS: (U) *PHOTOELECTRONS, *SPECTROSCOPY, ATMOSPHERES, ATMOSPHERICS, ATOMS, CHANNELS, ELECTRONICS, EXCHANGE, EXCHANGE REACTIONS, EXTRACTION, FUNCTIONS, HYDROCARBONS, IONIZATION, IONS, MASS, MASS SPECTRA,

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A248 776 5/1 5/6

AD-A248 775 5/1

RESEARCH AND DEVELOPMENT LABS CULVER CITY CA

RESEARCH AND DEVELOPMENT LABS CULVER CITY CA

(U) United States Air Force Summer Research Program 1991.
High School Apprenticeship Program (HSAP) Reports.
Volume 13. Wright Laboratory.

(U) United States Air Force Summer Research Program 1991.
High School Apprenticeship Program (HSAP) Reports.
Volume 12. Rome Laboratory, Arnold Engineering
Development Plan.

DESCRIPTIVE NOTE: Rept. for 30 Sep 90-30 Sep 91,

DESCRIPTIVE NOTE: Rept. for 30 Sep 90-30 Sep 91,

JAN 92 558P

JAN 92 430P

PERSONAL AUTHORS: Moore, Gary

PERSONAL AUTHORS: Moore, Gary

CONTRACT NO. F49620-90-C-0076

CONTRACT NO. F49620-90-C-0076

MONITOR: AFOSR, XF
TR-92-0180, AFOSR

MONITOR: AFOSR, XF
TR-92-0179, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also Volume 1, AD-A248 763.

SUPPLEMENTARY NOTE: See also Volume 13, AD-A248 776.

ABSTRACT: (U) High school students who live in communities where Air Force laboratories are located have an opportunity to spend eight weeks during the summer doing scientific research at the laboratory. Each student is assigned a mentor from the laboratory. During the summer of 1991 132 students participated in the program. Each student was required to submit a report on their accomplishments. Those student reports were consolidated and bound into this annual report.

ABSTRACT: (U) High school students who live in communities where Air Force laboratories are located have an opportunity to spend eight weeks during the summer doing scientific research at the laboratory. Each student is assigned a mentor from the laboratory. During the summer of 1991 132 students participated in the program. Each student was required to submit a report on their accomplishments. Those student reports were consolidated and bound into this annual report.

DESCRIPTORS: (U) *AIR FORCE RESEARCH, *APPRENTICESHIP, AIR FORCE, COMMUNITIES, LABORATORIES, REPORTS, SCHOOLS, STUDENTS, SUMMER.

DESCRIPTORS: (U) *AIR FORCE RESEARCH, AIR FORCE, COMMUNITIES, LABORATORIES, REPORTS, SCHOOLS, STUDENTS, SUMMER, APPRENTICESHIP.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A248 774 5/1 5/6

AD-A248 773 5/1 5/6

RESEARCH AND DEVELOPMENT LABS CULVER CITY CA

RESEARCH AND DEVELOPMENT LABS CULVER CITY CA

(U) United States Air Force Summer Research Program 1991.
High School Apprenticeship Program (HSAP) Reports.
Volume 11. Phillips Laboratory, Civil Engineering
Laboratory.

(U) United States Air Force Summer Research Program 1991.
High School Apprenticeship Program (HSAP) Reports.
Volume 10. Armstrong Laboratory.

DESCRIPTIVE NOTE: Rept. for 30 Sep 90-30 Sep 91,

DESCRIPTIVE NOTE: Rept. for 30 Sep 90-30 Sep 91.

JAN 92 387P

JAN 92 422P

PERSONAL AUTHORS: Moore, Gary

PERSONAL AUTHORS: Moore, Gary

CONTRACT NO. F49620-90-C-0076

CONTRACT NO. F49620-90-C-0076

MONITOR: AFOSR, XF
TR-92-0178, AFOSR

MONITOR: AFOSR, XF
TR-92-0177, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also Volume 12, AD-A248 775.

SUPPLEMENTARY NOTE: See also Volume 11, AD-A248 774.

ABSTRACT: (U) High school students who live in communities where Air Force laboratories are located have an opportunity to spend eight weeks during the summer doing scientific research at the laboratory. Each student is assigned a mentor from the laboratory. During the summer of 1991 132 students participated in the program. Each student was required to submit a report on their accomplishments. Those student reports were consolidated and bound into this annual report.

ABSTRACT: (U) High school students who live in communities where Air Force laboratories are located have an opportunity to spend eight weeks during the summer doing scientific research at the laboratory. Each student is assigned a mentor from the laboratory. During the summer of 1991 132 students participated in the program. Each student was required to submit a report on their accomplishments. Those student reports were consolidated and bound into this annual report.

DESCRIPTORS: (U) *AIR FORCE RESEARCH, APPRENTICESHIP, AIR FORCE, COMMUNITIES, LABORATORIES, REPORTS, SCHOOLS, STUDENTS, SUMMER.

DESCRIPTORS: (U) *STUDENTS, *AIR FORCE RESEARCH, *APPRENTICESHIP, AIR FORCE, COMMUNITIES, LABORATORIES, REPORTS, SCHOOLS, SUMMER.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A248 772 5/1 5/6

AD-A248 771 5/1 5/6

RESEARCH AND DEVELOPMENT LABS CULVER CITY CA

RESEARCH AND DEVELOPMENT LABS CULVER CITY CA

(U) United States Air Force Summer Research Program 1991.
Graduate Student Research Program (GSRP) Reports.
Volume 9. Wright Laboratory.

(U) United States Air Force Summer Research Program 1991.
Graduate Student Research Program (GSRP) Reports.
Volume 8. Rome Laboratory. Arnold Engineering
Development Center, F. J. Seiler Research Laboratory.

DESCRIPTIVE NOTE: Rept. for 30 Sep 90-30 Sep 91.

DESCRIPTIVE NOTE: Rept. for 30 Sep 90-30 Sep 91.

JAN 92 722P

JAN 92 836P

PERSONAL AUTHORS: Moore, Gary

PERSONAL AUTHORS: Moore, Gary

CONTRACT NO. F49620-90-C-0076

CONTRACT NO. F49620-90-C-0076

MONITOR: AFOSR, XF
TR-92-0176, AFOSRMONITOR: AFOSR, XF
TR-92-0175, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also Volume 10, AD-A248 773.

SUPPLEMENTARY NOTE: See also Volume 9, AD-A248 772.

ABSTRACT: (U) This program was started in 1982 as an adjunct to the SFRP. Its objectives are to permit graduate students to participate in research under the direction of a faculty member at an Air Force laboratory; stimulate professional association among graduate students, their supervising professors, and professional peers in the Air Force; to further research objectives of the Air Force; and to expose graduate students to potential thesis topics in areas of interest to the Air Force. During the summer of 1991 142 graduate students performed research for 10 weeks at Air Force laboratories. Their reports were submitted to RDL and consolidated into this annual report.

ABSTRACT: (U) This program was started in 1982 as an adjunct to the SFRP. Its objectives are to permit graduate students to participate in research under the direction of a faculty member at an Air Force laboratory; stimulate professional association among graduate students, their supervising professors, and professional peers in the Air Force; to further research objectives of the Air Force; and to expose graduate students to potential thesis topics in areas of interest to the Air Force. During the summer of 1991 142 graduate students performed research for 10 weeks at Air Force laboratories. Their reports were submitted to RDL and consolidated into this annual report.

DESCRIPTORS: (U) *STUDENTS, *AIR FORCE RESEARCH, AIR, AIR FORCE, GRADUATES, LABORATORIES, ORGANIZATIONS, REPORTS, SUMMER, THESES.

DESCRIPTORS: (U) *STUDENTS, *AIR FORCE RESEARCH, AIR FORCE, GRADUATES, LABORATORIES, ORGANIZATIONS, REPORTS, SUMMER, THESES.

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AD-A248 771

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A248 770 5/2 5/6

AD-A248 769 5/1 5/6

RESEARCH AND DEVELOPMENT LABS CULVER CITY CA

RESEARCH AND DEVELOPMENT LABS CULVER CITY CA

(U) United States Air Force Summer Research Program 1991.
Graduate Student Research Program (GSRP) Reports.
Volume 7. Phillips Laboratory, Civil Engineering
Laboratory.

(U) United States Air Force Summer Research Program 1991.
Graduate Student Research Program (GSRP) Reports.
Volume 6. Armstrong Laboratory, Wilford Hall Medical
Center.

DESCRIPTIVE NOTE: Rept. for 30 Sep 90-30 Sep 91,

DESCRIPTIVE NOTE: Rept. for 30 Sep 90-30 Sep 91,

JAN 92 393P

JAN 92 546P

PERSONAL AUTHORS: Moore, Gary

PERSONAL AUTHORS: Moore, Gary

CONTRACT NO. F49620-90-C-0076

CONTRACT NO. F49620-90-C-0076

MONITOR: AFOSR, XF
TR-92-0174, AFOSR

MONITOR: AFOSR, XF
TR-92-0173, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also Volume 8, AD-A248 771.

SUPPLEMENTARY NOTE: See also Volume 7, AD-A248 770.

ABSTRACT: (U) This program was started in 1982 as an adjunct to the SFRP. Its objectives are to permit graduate students to participate in research under the direction of a faculty member at an Air Force laboratory; stimulate professional association among graduate students, their supervising professors, and professional peers in the Air Force; and to expose graduate students to the Air Force; and to further research objectives of potential thesis topics in areas of interest to the Air Force. During the summer of 1991 142 graduate students performed research for 10 weeks at Air Force laboratories. Their reports were submitted to RDL and consolidated into this annual report.

ABSTRACT: (U) This program was started in 1982 as an adjunct to the SFRP. Its objectives are to permit graduate students to participate in research under the direction of a faculty member at an Air Force laboratory; stimulate professional association among graduate students, their supervising professors, and professional peers in the Air Force; and to further research objectives of the Air Force; and to expose graduate students to potential thesis topics in areas of interest to the Air Force. During the summer of 1991 142 graduate students performed research for 10 weeks at Air Force laboratories. Their reports were submitted to RDL and consolidated into this annual report.

DESCRIPTORS: (U) *STUDENTS, *AIR FORCE RESEARCH, AIR FORCE, GRADUATES, LABORATORIES, ORGANIZATIONS, REPORTS, SUMMER, THESES.

DESCRIPTORS: (U) *AIR FORCE RESEARCH, *STUDENTS, AIR FORCE, GRADUATES, LABORATORIES, ORGANIZATIONS, REPORTS, SUMMER, THESES.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A248 768 5/1

AD-A248 767 5/1

RESEARCH AND DEVELOPMENT LABS CULVER CITY CA

RESEARCH AND DEVELOPMENT LABS CULVER CITY CA

(U) United States Air Force Summer Research Program 1991.
Summer Faculty Research Program (SFRP) Reports. Volume
58. Wright Laboratory.

(U) United States Air Force Summer Research Program 1991.
Summer Faculty Research Program (SFRP) Reports. Volume
5A. Wright Laboratory.

DESCRIPTIVE NOTE: Rept. for 30 Sep 90-30 Sep 91,

DESCRIPTIVE NOTE: Rept. for 30 Sep 90-30 Sep 91,

JAN 92 498P

JAN 92 528P

PERSONAL AUTHORS: Moore, Gary

PERSONAL AUTHORS: Moore, Gary

CONTRACT NO. F49620-90-C-0076

CONTRACT NO. F49620-90-C-0076

MONITOR: AFOSR, XF
TR-92-0172, AFOSR

MONITOR: AFOSR, XF
TR-92-0171, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also Volume 6, AD-A248 769.

SUPPLEMENTARY NOTE: See also Volume 5B, AD-A248 768.

ABSTRACT: (U) The purpose of this program is to develop the basis for continuing research of interest to the Air Force at the institution of the faculty member; to stimulate continuing relations among faculty members and professional peers in the Air Force; to enhance the research interests and capabilities of scientific and engineering educators; and to provide follow-on funding for research of particular promise that was started at an Air Force laboratory under the Summer Faculty Research Program. During the summer of 1991 170 university faculty conducted research at Air Force laboratories for a period of 10 weeks. Each participant provided a report of their research, and these reports are consolidated into this annual report.

ABSTRACT: (U) The purpose of this program is to develop the basis for continuing research of interest to the Air Force at the institution of the faculty member; to stimulate continuing relations among faculty members and professional peers in the Air Force; to enhance the research interests and capabilities of scientific and engineering educators; and to provide follow-on funding for research of particular promise that was started at an Air Force laboratory under the Summer Faculty Research Program. During the summer of 1991 170 university faculty conducted research at Air Force laboratories for a period of 10 weeks. Each participant provided a report of their research, and these reports are consolidated into this annual report.

DESCRIPTORS: (U) *AIR FORCE RESEARCH, AIR FORCE, ENGINEERING, LABORATORIES, REPORTS, SUMMER, UNIVERSITIES.

DESCRIPTORS: (U) *AIR FORCE RESEARCH, AIR FORCE, ENGINEERING, LABORATORIES, REPORTS, SUMMER, UNIVERSITIES.

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AD-A248 767

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DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T85005

AD-A248 766 5/1 15/5

AD-A248 765 5/1 15/5

RESEARCH AND DEVELOPMENT LABS CULVER CITY CA

RESEARCH AND DEVELOPMENT LABS CULVER CITY CA

- (U) United States Air Force Summer Research Program 1991.
 Summer Faculty Research Program (SFRP) Reports. Volume
 4. Rome Laboratory, Arnold Engineering Development
 Center, F. J. Seller Research Laboratory.

- (U) United States Air Force Summer Research Program 1991.
 Summer Faculty Research Program (SFRP) Reports. Volume
 3. Phillips Laboratory, Civil Engineering Laboratory.

DESCRIPTIVE NOTE: Rept. for 30 Sep 90-30 Sep 91.

DESCRIPTIVE NOTE: Rept. for 30 Sep 90-30 Sep 91.

JAN 92 662P

JAN 92 772P

PERSONAL AUTHORS: Moore, Gary

PERSONAL AUTHORS: Moore, Gary

CONTRACT NO. F49620-90-C-0076

CONTRACT NO. F49620-90-C-0076

MONITOR: AFOSR, XF
 TR-92-0170, AFOSRMONITOR: AFOSR, XF
 TR-92-0169, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also Volume 5, AD-A248 767.

SUPPLEMENTARY NOTE: See also Volume 4, AD-A248 766.

ABSTRACT: (U) The purpose of this program is to develop the basis for continuing research of interest to the Air Force at the institution of the faculty member; to stimulate continuing relations among faculty members and professional peers in the Air Force; to enhance the research interests and capabilities of scientific and engineering educators; and to provide follow-on funding for research of particular promise that was started at an Air Force laboratory under the Summer Faculty Research Program. During the summer of 1991 170 university faculty conducted research at Air Force laboratories for a period of 10 weeks. Each participant provided a report of their research, and these reports are consolidated into this annual report.

ABSTRACT: (U) The purpose of this program is to develop the basis for continuing research of interest to the Air Force at the institution of the faculty member; to stimulate continuing relations among faculty members and professional peers in the Air Force; to enhance the research interests and capabilities of scientific and engineering educators; and to provide follow-on funding for research of particular promise that was started at an Air Force laboratory under the Summer Faculty Research Program. During the summer of 1991 170 university faculty conducted research at Air Force laboratories for a period of 10 weeks. Each participant provided a report of their research, and these reports are consolidated into this annual report.

DESCRIPTORS: (U) *AIR FORCE RESEARCH, AIR FORCE, ENGINEERING, LABORATORIES, REPORTS, SUMMER, UNIVERSITIES, CIVIL ENGINEERING, LOGISTICS SUPPORT.

DESCRIPTORS: (U) *AIR FORCE RESEARCH, AIR FORCE, ENGINEERING, LABORATORIES, REPORTS, SUMMER, UNIVERSITIES, CIVIL ENGINEERING, LOGISTICS SUPPORT.

AD-A248 766

AD-A248 765

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DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T85005

AD-A248 764 5/1 15/5

AD-A248 763 5/1 5/6

RESEARCH AND DEVELOPMENT LABS CULVER CITY CA

RESEARCH AND DEVELOPMENT LABS CULVER CITY CA

- (U) United States Air Force Summer Research Program 1991.
Summer Faculty Research Program (SFRP) Reports. Volume
2. Armstrong Laboratory, Wilford Hall Medical Center.

- (U) United States Air Force Summer Research Program 1991.
Volume 1. Program Management Report.

DESCRIPTIVE NOTE: Rept. for 30 Sep 90-30 Sep 91.

DESCRIPTIVE NOTE: Rept. for 30 Sep 90-30 Sep 91.

JAN 92 785P

JAN 92 638P

PERSONAL AUTHORS: Moore, Gary

PERSONAL AUTHORS: Moore, Gary

CONTRACT NO. F49620-90-C-0076

CONTRACT NO. F49620-90-C-0076

MONITOR: AFOSR, XF
TR-92-0168, AFOSR

MONITOR: AFOSR, XF
TR-92-0167, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also Volume 3. AD-A248 765.

SUPPLEMENTARY NOTE: See also Volume 2. AD-A248 764.

ABSTRACT: (U) The purpose of this program is to develop the basis for continuing research of interest to the Air Force at the institution of the faculty member; to stimulate continuing relations among faculty members and professional peers in the Air Force; to enhance the research interests and capabilities of scientific and engineering educators; and to provide follow-on funding for research of particular promise that was started at an Air Force laboratory under the Summer Faculty Research program. During the summer of 1991 170 university faculty conducted research at Air Force laboratories for a period of 10 weeks. Each participant provided a report of their research, and these reports are consolidated into this annual report.

DESCRIPTORS: (U) *AIR FORCE RESEARCH, AIR FORCE, ENGINEERING, LABORATORIES, REPORTS, SUMMER, UNIVERSITIES, LOGISTICS SUPPORT, CIVIL ENGINEERING.

DESCRIPTORS: (U) *AIR FORCE RESEARCH, ABSTRACTS, AIR FORCE, APPRENTICESHIP, GRADUATES, LABORATORIES, MINORITIES, NUMBERS, RECRUITS, REPORTS, SCHOOLS, STATISTICS, STUDENTS, SUMMER, UNIVERSITIES.

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AD-A248 763

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DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T85005

AD-A248 746

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AD-A248 745

21/2

21/4

CALIFORNIA UNIV DAVIS DEPT OF MECHANICAL ENGINEERING

UNITED TECHNOLOGIES RESEARCH CENTER EAST HARTFORD CT

(U) A Technique for Measuring Lagrangian and Eulerian Particle Statistics in a Turbulent Flow.

91

7P

DEC 91

11P

PERSONAL AUTHORS: Call, C. J.; Kennedy, I. M.

PERSONAL AUTHORS: Bonczyk, Paul A.

CONTRACT NO. AFOSR-89-0392

CONTRACT NO. F49620-86-C-0054

PROJECT NO. 2308

PROJECT NO. 2308

TASK NO. A2

TASK NO. A2

MONITOR: AFOSR, XF
TR-92-0252, AFOSRMONITOR: AFOSR, XF
TR-92-0250, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

Availability: Pub. in Experiments in Fluids, v12 p125-130 1991. Available only to DTIC users. No copies furnished by NTIS.

Availability: Pub. in Fuel, v70 p1403-1411 Dec 91. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) An experimental technique is described which has been developed to study particle dispersion in a round turbulent jet. Droplets are injected on the jet axis, and a laser sheet and position sensitive photomultiplier tube are used to track their radial displacement. Data processing is greatly simplified compared to video or photo imaging techniques which provide similar measurements. Statistically large samples are used to calculate dispersion and axial velocity as a function of axial downstream distance or particle time-of-flight. Dispersion and velocity statistics can be computed which are Lagrangian or Eulerian in nature. The technique has been demonstrated with 69 micron droplets of hexadecane in a jet of air with a Reynolds number of 15,000; in principle it could be used to study the motion of very small quasi-fluid particles.

DESCRIPTORS: (U) *TURBULENT FLOW, *PARTICLE SPECTRA, *MEASUREMENT, *DISPERSIONS, VELOCITY, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A2.

ABSTRACT: (U) Parameters which characterize soot precursor and particulate species in a C2H4/O2/N2/Ar premixed flame have been measured both with and without alkali and alkaline earth salts present as fuel additives. The principal experimental techniques which were used include Mie scattering and optical extinction for particulate size, number density and volume fraction, and gas chromatographic analysis of quartz probe collected samples for the determination of precursor concentrations. Other critical parameters such as flame temperature and metal species concentrations were addressed as well. Temperature was determined from the Wien equation using measured values of the flame's absorptivity and brightness. Species concentrations were estimated from analytical expressions known to be reliable for premixed flames. Data are presented which give the effects of the above metals on the particulates for three well-defined but different ethylene flames. The efficiency of a given metal is shown to be dependent almost exclusively on temperature and the metal atom's ionization potential; the higher the temperature and the lower the ionization potential, the greater is the soot removal. (Author)

DESCRIPTORS: (U) *FUEL ADDITIVES, *FLAMES, *METALS, *ALKALI METALS, *ALKALINE EARTH METALS, *SOOT, FUELS.

AD-A248 746

AD-A248 745

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A248 745 CONTINUED

AD-A248 744 20/4

ETHYLENE, OXYGEN, NITROGEN, ARGON, COMBUSTION, PRECURSORS,
REPRINTS.

STANFORD UNIV CA DEPT OF MECHANICAL ENGINEERING

(U) Effects of Sidewall Disturbances on the Supersonic
Mixing Layer.

IDENTIFIERS: (U) PEG1102F, WJAFOSR308A2.

FEB 92 8P

PERSONAL AUTHORS: Clemens, N. T.; Mungal, M. G.

CONTRACT NO. AFOSR-90-0151

PROJECT NO. 3484

TASK NO. AS

MONITOR: AFOSR, XF
TR-92-0251, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Propulsion and Power, v8 n1
p249-251 Jan-Feb 92. Available only to DTIC users. No
copies furnished by NTIS.

Reprint: Effects of Sidewall Disturbances on the
Supersonic Mixing Layer.

DESCRIPTORS: (U) *JET MIXING FLOW, VORTICES, SHOCK,
SUPERSONIC FLOW, MACH NUMBER, REPRINTS.

IDENTIFIERS: (U) PEG1103D, WJAFOSR3484AS, Supersonic
mixing layer, SWSVG(Side Wall Shock Vortex Generators).

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A248 743 6/4 5/8

AD-A248 678 21/2

ROCHESTER UNIV NY CENTER FOR VISUAL SCIENCE

TRW SPACE AND TECHNOLOGY GROUP REDONDO BEACH CA

(U) Reference Frames in Vision.

(U) Evaluating a Simple Model for Laminar-Flame-Propagation Rates. 2. Spherical Geometry.

DESCRIPTIVE NOTE: Annual rept. 15 Jan 91-14 Jan 92,

DESCRIPTIVE NOTE: Published paper,

MAR 92 6P

91 36P

PERSONAL AUTHORS: Hayhoe, Mary M.

PERSONAL AUTHORS: Carrier, G.; Fendell, F.; Chen, K.; Cook, S.

REPORT NO. 5-27959

CONTRACT NO. AFOSR-91-0332

CONTRACT NO. F49620-87-C-0081

PROJECT NO. 2313

PROJECT NO. 2308

TASK NO. A9

TASK NO. A2

MONITOR: AFOSR, XF
92-0264, AFOSR

MONITOR: AFOSR, XF
TR-92-0244, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The goal of this project is to examine the consequences of observer motion for visual function. The research has focussed on two issues: One issue is how a grossly time-varying retinal input (because of eye, head, and body motion) results in the perception of a continuous and directionally stable visual world. A second issue concerns how the information in successive views is related, and the nature of the visual information retained from previous views. Understanding these processes is important for a wide variety of visual motor tasks. In the past year progress has been made on the following six projects. (1) The role of the visual scene and eye position signals in visual stability; (2) The role of attention in integrating across saccades; (3) Reference frames for spatial memory; (4) Hand-eye coordination during complex tasks; (5) Detectability of changes during saccades; and (6) Short term visual memory of complex scenes.

DESCRIPTORS: (U) *VISUAL PERCEPTION, *MOTION, *SPATIAL DISTRIBUTION, SIGNAL PROCESSING, MEMORY (PSYCHOLOGY), RETINA.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A9..

AD-A248 743

AD-A248 678

UNCLASSIFIED

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T85005

Availability: Pub. in Combustion Science and Technology, v79 p229-245, 1991. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) The propagation of a spherical flame radially outward (from an unspecified ignition with purely local and transient consequences) is examined by approximate analysis for an initially homogeneous gaseous premixture. A direct one-step irreversible bimolecular second-order chemical reaction with large Arrhenius activation energy is adopted, but account is taken of the modified exothermicity owing to the partial dissociation of product species and to other causes of incomplete oxidation. The effects arising from differing diffusivities for heat transfer and reactant-species mass transfer, and from varying the equivalence ratio of the premixture, are considered. Algebraic expressions and a simple quadrature are derived which suffice to describe the evolution of the spherical flame speed to the asymptotic planar-flame value, as the magnitude of the flame radius increases from values modestly in excess of the diffusive scale to values which are large multiples of the diffusive scale, for a flame with a two-zone (convective-diffusive, diffusive-reactive) structure. Limited published data on the variation of flamefront-

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DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T85005

AD-A248 678 CONTINUED

speed-versus-time behavior with equivalence ratio for simple-hydrocarbon/air mixtures are examined in view of the results. Laminar-Flame-Propagation, Deflagration, Flame Propagation Theory.

DESCRIPTORS: (U) *DEFLAGRATION, *FLAME PROPAGATION, ACTIVATION, ACTIVATION ENERGY, AIR, BEHAVIOR, CHEMICAL REACTIONS, CHEMICALS, DISSOCIATION, ENERGY, FLAMES, HEAT, HEAT TRANSFER, HYDROCARBONS, IGNITION, MASS, MASS TRANSFER, MIXTURES, OXIDATION, PROPAGATION, RATIOS, SCALE, STRUCTURES, THEORY, TIME, TRANSFER, TRANSIENTS, VALUE, VARIATIONS, VELOCITY, REPRINTS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2308A2, *Laminar flame propagation, *Flame propagation theory, Spherical geometry.

AD-A248 674 11/4

WASHINGTON UNIV SEATTLE DEPT OF MECHANICAL ENGINEERING

(U) Damage Accumulation Process in Advanced Metal Matrix Composite Under Thermal Cycling.

DESCRIPTIVE NOTE: Final rept. 16 Oct 90-15 Nov 91.

NOV 91 91P

PERSONAL AUTHORS: Taya, Minoru; Armstrong, William D.; Dunn, Marty

REPORT NO. UW-ME-91-002

CONTRACT NO. AFOSR-91-0234

PROJECT NO. 2302

TASK NO. BS

MONITOR: AFOSR, XF
TR-92-0256, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This research was intended the second stage of thermal cycling damage in metal matrix composites where progressive dimensional change along the fiber is observed. This dimensional change was documented by SEM-image analysis technique in terms of damage area distribution along the matrix-fiber interface. The progressive dimensional change was then predicted by using elastic/plastic/creep analytical model, resulting in a good agreement. Based on the analytical study, we designed a new type of MMC which possesses higher thermal cycling resistance and where additional short fibers are embedded in the matrix to make a MMC hybrid MMC. It was found that the main mechanisms for higher thermal cycling resistance in the hybrid MMC are: (1) The apparent CTE of the matrix modified with additional short fibers is closer to that of the main fibers, resulting in smaller CTE mismatch, which would be a weaker driving force for thermal cycling damage. (2) Additional short fibers in the matrix give rise to higher density of dislocations which are punched out from the interface between the matrix and these short fibers, enhancing the in-situ mechanical properties of the matrix. Damage Accumulation in Thermal-Cycled Metal Matrix Composites.

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SEARCH CONTROL NO. T85005

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Experimental and Analytical Studies.

ARMED FORCES INST OF PATHOLOGY WASHINGTON DC

DESCRIPTORS: (U) *METAL MATRIX COMPOSITES, *THERMAL DEGRADATION, *DAMAGE ASSESSMENT, *FATIGUE(MECHANICS), ACCUMULATION, AGREEMENTS, CREEP, DAMAGE, DENSITY, DISLOCATIONS, DISTRIBUTION, FIBERS, IMAGES, INTERFACES, MECHANICAL PROPERTIES, METALS, MODELS, PLASTICS, RESISTANCE, THERMAL STRESSES, MODULUS OF ELASTICITY, INTERFACES, TEMPERATURE, MECHANICAL PROPERTIES, CYCLIC LOADS, FIBER REINFORCED COMPOSITES, THERMAL EXPANSION.

(U) The Effect of Hyperbaric Oxygen and Pentoxifylline on the Rate of Neovascularization in Mice.

DESCRIPTIVE NOTE: Final technical rept. 30 Sep 89-29 Jan 92,

JAN 92 80P

PERSONAL AUTHORS: Griswell, D. W.; Mehm, W. J.

CONTRACT NO. AFOSR-89-0543

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR, XF
TR-92-0242, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) A polyvinyl alcohol sponge was implanted in mouse subcutaneous tissue to investigate two treatments (intermittent hyperoxia (100% oxygen for 90 mins twice a day at 250 kPa) and epidermal growth factor (EGF) which may modulate fibroblast infiltration. Two conditions were established for treatment: of animals to chronic hypoxia (12% oxygen for 23 hr/day), simulating low oxygen tensions in problem wounds, and normoxia (21% oxygen). In experiments evaluating EGF, sponges were implanted whose core contained EGF covered with a slow release polymer, the other group with placebo. Sponges were harvested at 15, 25, or 32 days after implantation. The area of the disc infiltrated by fibroblasts was measured by planimetry. After 32 days exposure to hypoxic conditions (7 days before sponge implantation and 25 days after) EGF slightly increased (NS) the area of fibroblast infiltration to placebo both hypoxic and normoxic conditions. No significant differences were observed between the hypoxically conditioned and normoxic controls. Neither chronic hypoxia alone nor chronic hypoxia with intermittent hyperbaric oxygen a 21-32 days after disc implantation affected the area of fibroblast infiltration. EGF significantly increased the area of the fibrous capsule around small PVA sponges after 15 days under normoxic conditions. Fibroblast-Hyperbaric, Oxygen-

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Hypoxia-Polyvinyl alcohol sponge-wound.

DESCRIPTORS: (U) *HEALING, *HYPOXIA, *HYPERBARIC MEDICINE, ANIMALS, FIBROBLASTS, HYPEROXIA, IMPLANTATION, OXYGEN, PLACEDOS, POLYVINYL ALCOHOL, RELEASE, SPONGES, SUBCUTANEOUS TISSUE, EPIDERMIS, WOUNDS AND INJURIES.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2312A5, *Epidermal growth factor, Neovascularization, Pentoxifylline.

UNITED TECHNOLOGIES RESEARCH CENTER EAST HARTFORD CT

(U) Effect of Ferrocene on Soot in a Prevaporized Iso-Octane/Air Diffusion Flame.

DESCRIPTIVE NOTE: Published paper.

91 28P

PERSONAL AUTHORS: Bonczyk, P. A.

CONTRACT NO. F49620-86-C-0054

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR, XF
TR-92-0249, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Combustion and Flame, v87 p233-244, 1991. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) Measurements were carried out to determine the effect on soot when ferrocene is added to a prevaporized isooctane/air diffusion flame. Data were obtained for operation of the flame above and below its smoke-point. Mile scattering was used to determine soot size, number density, and volume fraction with and without ferrocene. In addition, quartz microprobe sampling and gas chromatographic analysis were used to determine ferrocene's effect on soot precursor hydrocarbon and other species. The flame temperature was measured using a novel method based on infrared emission tomography. Ferrocene shortened the time for soot to first appear in the flame, and caused the formation of solid iron oxide particulates. It perturbed the particulate's size and number density in a complex manner in that increases and decreases of the latter were observed at early and late residence times, respectively. Ferrocene was very effective in and near the flame's terminus, thereby appearing to enhance soot burnout. On the whole, ferrocene did not significantly affect the soot precursor chemistry. An exception to this was the observed simultaneous decrease and increase of acetylene

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TRW SPACE AND TECHNOLOGY GROUP REDONDO BEACH CA

and molecular hydrogen mole fractions, respectively, which may be interpreted as an enhancement of acetylene oxidation. Solid effluent was collected above the flame and subjected to an Auger-type chemical analysis in order to look for coating of iron and/or its oxides by soot, which, if present, would support a catalytic mechanism for enhanced soot burnout with ferrocene seeding; the Auger data were not fully consistent with the aforesaid coating. Ferrocene did not affect flame temperature, which ruled out any thermally related explanation of its behavior in relation to soot suppression. Ferrocene, Flame soot.

(U) Ignition of H₂/O₂/NH₃, H₂/Air/NH₃ and CH₄/O₂/NH₃ Mixtures by Excimer-Laser Photolysis of NH₃.

91 13P

PERSONAL AUTHORS: Chou, Mau-Song; Zukowski, Tmitri J.

CONTRACT NO. F49620-87-C-0081

PROJECT NO. 2308

DESCRIPTORS: (U) *FERROCENES, *SOOT, *CHEMICAL REACTIONS, ACETYLENE, ADDITION, AIR, AUGERS, AUGMENTATION, BEHAVIOR, BURNOUT, CHEMICAL ANALYSIS, CHEMICALS, CHEMISTRY, CHROMATOGRAPHIC ANALYSIS, COATINGS, DENSITY, DIFFUSION, EFFLUENTS, EMISSION, FLAMES, HYDROCARBONS, HYDROGEN, IRON, IRON OXIDES, MICROPROBES, NUMBERS, OPERATION, OXIDATION, OXIDES, PARTICULATES, PRECURSORS, QUARTZ, SAMPLING, SCATTERING, SEEDING, SMOKE, SOLIDS, SUPPRESSION, TEMPERATURE, TIME, TOMOGRAPHY, VOLUME, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A2.

TASK NO. A2

MONITOR: AFOSR, XF
TR-92-0245, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Combustion and Flame, v87 n191-202 1991. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) Volumetric ignition of H₂/O₂, H₂/air, and CH₄/O₂ mixtures (in an open flow system, initially at 1 atm and room temperature) is achieved via photolysis of a small amount of NH₃ present in the flow mixtures. The photolysis is accomplished by an ArF excimer laser operated at 193 nm. The ignition appears to be homogeneous, since the ignition-delay times measured at several locations are approximately identical. The minimum ignition-energy density is measured to be 137 + 8, 190 + 20, and 380 + or 30 mJ/cm² for stoichiometric mixtures of H₂/O₂/NH₃, H₂/air/NH₃, and CH₄/O₂/NH₃, respectively, and appears to be insensitive to fuel-equivalence-ratio values between 0.35 and 3.0. The ignition-delay time depends strongly on both the initial NH concentration and the laser-energy-deposition density. However, the ignition-delay time is not sensitive to the fuel equivalence ratio. The measured minimum ignition-energy density appears to be substantially lower than that predicted by a kinetic modeling calculation. This result implies that the hot H atoms produced by the photolysis of NH₃ may play an important role in facilitating the ignition, combustion, ignition, photolysis, flame, propulsion, National Aerospace Plane.

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CONTINUED

DESCRIPTORS: (U) *COMBUSTION, *EXCIMER, *IGNITION, *LASERS, *MIXTURES, *PHOTOLYSIS, *AMMONIA, AEROSPACEPLANES, AIR, ATOMS, DELAY, DENSITY, DEPOSITION, ENERGY, FLAMES, FLOW, FUELS, KINETICS, RATIOS, TIME, REPRINTS, FUELS, METHANE, OXYGEN, HYDROGEN, SPACE PROPULSION.

IDENTIFIERS: (U) PE61102F, WJAF0SR2308A2, Photochemical ignitions, Propulsions, National aerospace plane.

AD-A248 655

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9/3

TRW SPACE AND TECHNOLOGY GROUP REDONDO BEACH CA

(U) Laser Initiated Conical Detonation Wave for Supersonic Combustion. II,

JAN 92

12P

PERSONAL AUTHORS: Fendell, F.; Mitchell, J.; McGregor, R.; Magiawala, K.; Sheffield, M.

CONTRACT NO. F49620-90-C-0070

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR, XF
TR-92-0253, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in AIAA Aerospace Sciences Meeting and Exhibit (30th), AIAA-92-0088, p1-10, 6-9 Jan 92. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) Further theoretical studies are undertaken of the feasibility of an air-breathing supersonic combustor based on a stabilized, conically configured (oblique) detonation wave. The conical wave is the resultant of the interaction of a train of spherical detonation waves, each directly initiated by a very rapidly repeated pulsed laser, which is tightly focused on a fixed site in a steady uniform supersonic stream of combustible gaseous mixture. Here, the length of an axisymmetric (nearly conical) nozzle required to exhaust the reacted mixture at ambient-atmosphere pressure is estimated by a steady isentropic ideal-gas flow calculation. Then the thrust-to-drag ratio achievable with such a combustor for upper-atmospheric flight is roughly characterized. Finally, proof-of-principle laboratory experiments needed to establish the capacity of existing laser sources to achieve the direct initiation of detonation in hydrogen/air mixtures under conditions of practical interest are outlined. Detonation Wave Engine, Oblique Detonation Waves, Supersonic Combustion.

DESCRIPTORS: (U) *COMBUSTORS, *DETONATION WAVES, *PULSED

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LASERS, *SUPERSONIC COMBUSTION, AIR, AIR BREATHING, ATMOSPHERES, COMBUSTION, DETONATIONS, DRAG, ENGINES, FLIGHT, FLOW, GAS FLOW, HYDROGEN, INTERACTIONS, LABORATORIES, LASERS, LENGTH, MIXTURES, NOZZLES, PRESSURE, RATIOS, RESPIRATION, SITES, SOURCES, STREAMS, THRUST, WAVES, EXHAUST NOZZLES, REPRINTS, JET MIXING FLOW, COMBUSTION STABILITY.

TRW SPACE AND TECHNOLOGY GROUP REDONDO BEACH CA

(U) Evaluating a Simple Model for Laminar-Flame-Propagation Rates. 1. Planar Geometry,

91 22P

PERSONAL AUTHORS: Carrier, G.; Fendell, F.; Chen, K.; Vazirani, M.

CONTRACT NO. F49620-87-C-0081

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR, XF
TR-92-0246, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Combustion Science and Technology. v79 p207-227 1991. Available only to DTIC users. No copies furnished by NTIS.

Reprint: Evaluating a Simple Model for Laminar-Flame-Propagation Rates. 1. Planar Geometry.

DESCRIPTORS: (U) *FLAME PROPAGATION, ARRHENIUS EQUATION, OXIDATION, ACTIVATION ENERGY, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A2, *Flame speed, Homogeneous gaseous mixtures, Planar geometry.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A2.

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AD-A248 586 5/8

EXETER UNIV (UNITED KINGDOM) DEPT OF MATHEMATICS

STANFORD UNIV CA SCHOOL OF EDUCATION

(U) Instability and Transition in Compressible Boundary Layers.

(U) Individual Differences in Adaptive Processing in Complex Learning and Cognitive Performance.

DESCRIPTIVE NOTE: Final rept. 1 Nov 88-31 Oct 91.

DESCRIPTIVE NOTE: Final rept. 1 Sep 89-30 Apr 91.

DEC 91 14P

MAR 92 23P

PERSONAL AUTHORS: Hall, Philip

PERSONAL AUTHORS: Snow, Richard E.; Chastain, Robert L.; Jackson, Douglas, III

CONTRACT NO. AFOSR-89-0042

CONTRACT NO. AFOSR-89-0517

PROJECT NO. 2304

PROJECT NO. 2313

TASK NO. A4

TASK NO. A7

MONITOR: AFOSR, XF

TR-92-0214, AFOSR

MONITOR: AFOSR, XF

TR-92-0260, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Results are presented for (a) Real gas effects and Gortler vortices, (b) Nonparallel effects on Gortler vortex growth of Sutherland Law fluids, (c) Secondary instability analysis of finite amplitude Gortler vortices at hypersonic speeds, (d) Effects of crossflow velocities on Gortler vortices, (e) Mode interactions in compressible flows, (f) Receptivity theory for Gortler vortices. Hypersonic Boundary Layer, Gortler Vortex Instability.

ABSTRACT: (U) Theories of intelligence and learning ability emphasize individual differences in adaptation of information processing during performance on novel, changing tasks, but measures of adaptation have been lacking. This research sought to develop and evaluate such measures in samples of Air Force recruits. Computerized tests of verbal and spatial reasoning and of spatial-perceptual-motor performance were designed to provide scores reflecting raw and residualized differences between performance in homogeneous versus heterogeneous tasks. Reference tests represented conventional ability constructs. A complex learning task based on logic gates in electronics yielded criterion scores. Reliabilities of adaptation indices were moderate but within acceptable ranges. Low but significant correlations were obtained between some adaptation scores and some learning indices. Apparently, adaptation estimates can make a small but unique contribution to learning prediction. The research suggested further steps toward instrument improvement that seem clearly justifiable on both theoretical and practical grounds. Individual differences, Adaptive processing, Flexibility, learning, Complex cognitive abilities, Dynamic spatial abilities.

DESCRIPTORS: (U) *VORTICES, *COMPRESSIBLE FLOW, *HYPERSONIC FLOW, *BOUNDARY LAYER FLOW, AMPLITUDE, BOUNDARY LAYER, INSTABILITY, INTERACTIONS, LAYERS, SECONDARY, THEORY, CROSS FLOW.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A4, Gortler vortices, Sutherland law, Sutherland fluids, Hypersonic boundary layers.

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DESCRIPTORS: (U) *INFORMATION PROCESSING, *INTELLIGENCE,
*LEARNING, ADAPTATION, AIR, AIR FORCE, DYNAMICS,
ELECTRONICS, ESTIMATES, LOGIC, MOTORS, PREDICTIONS,
PROCESSING, REASONING, RECRUITS.

NORTHERN ILLINOIS UNIV DE KALB

(U) Estimating the Reliability of a System on the Basis of
Sample Paths.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A7.

DESCRIPTIVE NOTE: Final rept. 15 Jun 89-14 Dec 91.

DEC 91 4P

PERSONAL AUTHORS: Ebrahimi, Nader; Ramalingam, T.

CONTRACT NO. AFOSR-90-0402

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR, XF
TR-92-0257, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Synergism or the so-called dependence among the components of multivariate process induces a host of probabilistic structures among the hitting times of the processes. Conventionally, hitting time have been studied for isolated processes or for families of processes exhibiting specific dependence structures. Whereas this approach has been very useful, stochastic modeling of hitting times per se is equally fruitful. For example, it is possible to derive useful bounds for the reliability of a complex system like the wing of an aircraft if the joint dependence structure of the hitting times to failure of the components of the system is known adequately. The joint behavior of two or more hitting times, one each from the components of multivariate process is, therefore, of paramount importance in a plethora of disciplines. Research has continued on the development of positive (negative) dependence ideas and applied them to a number of areas.

DESCRIPTORS: (U) *MULTIVARIATE ANALYSIS, *SYNERGISM,
AIRCRAFT, APPROACH, BEHAVIOR, FAILURE, NUMBERS,
RELIABILITY, STRUCTURES, TIME, WINGS, GOODNESS OF FIT
TESTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5.

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SEARCH CONTROL NO. T85005

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UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF MATHEMATICS

WASHINGTON UNIV ST LOUIS MO DEPT OF SYSTEMS SCIENCE AND MATHEMATICS

(U) Mathematical and Numerical Analysis Aspects of Quasi-Neural Networks.

(U) Research and Development of the p-version of the Finite Element Model.

DESCRIPTIVE NOTE: Final technical rept. 1 Aug 88-30 Sep 91,

DESCRIPTIVE NOTE: Final technical rept. 1 Oct 87-31 Oct 91,

FEB 92 12P

FEB 92 42P

PERSONAL AUTHORS: Blum, Edward K.

PERSONAL AUTHORS: Katz, I. N.; Szabo, Barna A.; Greensfelder, A. P.

CONTRACT NO. AFOSR-88-0245

REPORT NO. SSM/92/1

PROJECT NO. 2304

CONTRACT NO. AFOSR-88-0017

TASK NO. K8

PROJECT NO. 2304

MONITOR: AFOSR, XF
TR-92-0226, AFOSR

TASK NO. A3

MONITOR: AFOSR, XF
TR-92-0225, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Basic results were obtained and published on the mathematical characterization of feed-forward and recurrent neural networks. It was shown how to approximate any continuous function by a 3-layer feed-forward network. The fixed-points and oscillations of recurrent networks were analyzed. Neural networks, dynamical systems.

DESCRIPTORS: (U) *NEURAL NETS, *NUMERICAL ANALYSIS, FUNCTIONS, LAYERS, NETWORKS, APPROXIMATION(MATHEMATICS), OSCILLATION.

IDENTIFIERS: (U) PE61102F, WJAFOSR2304K8, *Feed forward networks.

UNCLASSIFIED REPORT

ABSTRACT: (U) A new iteration, based on a textured model decomposition, is used to solve the assembled system of equations in the p-version of the finite element method for two-dimensional problems. Based on the hierarchic property of shape functions on a rectangle, a superelement consisting of four adjacent rectangles is constructed, and then partitioned into three blocks. The iteration is used to implement the p-version in parallel on an N-cube. Load balance and speed-up ratios are investigated. A new approach for analyzing fastened structural connections based on the p-version is studied. This approach takes nonlinearities into account. Model predictions are found to be in good agreement with experimental results reported.

DESCRIPTORS: (U) *FINITE ELEMENT ANALYSIS, *PROBLEM SOLVING, *TWO DIMENSIONAL, AGREEMENTS, APPROACH, BALANCE, DECOMPOSITION, EQUATIONS, FUNCTIONS, ITERATIONS, MODELS, PREDICTIONS, RATIOS, SHAPE, VELOCITY, NONLINEAR ANALYSIS, EXPERIMENTAL DATA.

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IDENTIFIERS: (U) PE61102F, WUAFOSR2304A3.

ARIZONA UNIV TUCSON COLL OF ENGINEERING AND MINES

(U) Expand Turbulence Laboratory Facilities to Meet New
DoD Research Interest.

DESCRIPTIVE NOTE: Final technical rept. 1 Oct 86-30 Sep
91,

MAR 92 6P

PERSONAL AUTHORS: Champagne, Frank H.

CONTRACT NO. AFOSR-87-0004

PROJECT NO. 2917

TASK NO. A1

MONITOR: AFOSR, XF
TR-92-0259, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The expansion of our turbulence laboratory facility funded by this DOD-URI award is complete. Two new test sections and a translator have been acquired for our wind tunnel. The new translator is specially designed to permit measurement of three-dimensional wakes with a minimum of blockage. Fortlier, our MASSCOMP 500 series laboratory computer was PRP upgraded to a 32-bit machine. Turbulence, Wakes, Wind Tunnel.

DESCRIPTORS: (U) *TURBULENCE, *WIND TUNNELS, AWARDS, COMPUTERS, EXPANSION, FACILITIES, LABORATORIES, MACHINES, MEASUREMENT, THREE DIMENSIONAL, TRANSLATORS, TUNNELS, WIND.

IDENTIFIERS: (U) PE61102F, WUAFOSR2917A1.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A248 580 9/1

WASHINGTON UNIV ST LOUIS MO

(U) Adaptive and Nonlinear Control.

DESCRIPTIVE NOTE: Final rept. 15 Aug 88-14 Aug 91,

FEB 92 36P

PERSONAL AUTHORS: Byrnes, Christopher I.

CONTRACT NO. AFOSR-88-0309

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR, XF
TR-92-0262, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This final report surveys the research accomplishments of a three year effort on the adaptive stabilization and control of distributed parameter systems and on the development of a systematic feedback design methodology for nonlinear control systems. In both areas, significant advances have been made by the use of concepts and techniques from dynamical systems theory, developing enhancements of classical frequency domain ideas (e.g. transmission zeroes, root locus methods, etc.) for both classes of systems. Indeed, for DPS the rigorous development of a root locus theory for parabolic systems is one of our most significant achievements. For nonlinear control design, we have enjoyed three unanticipated breakthroughs. First, the development of a nonlinear enhancement of transmission zeroes enabled the solution of a major open problem in nonlinear control - the nonlinear regulator problem - for systems operating near an equilibrium. Second, the geometric techniques underlying the solution of the regulator problem have been successfully applied to obtain 'off-line' feedback laws which solve nonlinear optimal control problems via a nonlinear analogue of the Riccati equation. Third, these advances, combined with the work described in this report, have led successfully to the development of a nonlinear robust control theory analogous to the development of H robust control for linear systems. Nonlinear Control, Stabilization of Distributed Parameter Systems, Dynamical

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Systems.

DESCRIPTORS: (U) *FEEDBACK, *ADAPTIVE CONTROL SYSTEMS, *NONLINEAR SYSTEMS, *ALGORITHMS, AUGMENTATION, CONTROL, CONTROL SYSTEMS, CONTROL THEORY, EQUATIONS, FREQUENCY, FREQUENCY DOMAIN, LINEAR SYSTEMS, LOCUS, METHODOLOGY, PARAMETERS, REGULATORS, RICCATI EQUATION, STABILIZATION, SURVEYS, THEORY, WORK.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A1.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

AD-A248 579 CONTINUED

AD-A248 579 12/4 12/1

RUTGERS - THE STATE UNIV NEW BRUNSWICK NJ

(U) Numerical Methods of Linear and Nonlinear Optimization.

EFFICIENCY, GRADIENTS, LINEAR ALGEBRA, MACHINES,
QUADRATIC PROGRAMMING, SCALE, WORK, ABSTRACTS, PROBLEM
SOLVING.

DESCRIPTIVE NOTE: Final rept. 1 Jul 87-30 Sep 91, IDENTIFIERS: (U) PE61102F, WUAFOSR2304A8.

SEP 91 32P

PERSONAL AUTHORS: Shanno, David F.

CONTRACT NO. AFOSR-87-0215

PROJECT NO. 2304

TASK NO. A8

MONITOR: AFOSR, XF
TR-92-0263, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The project has been concerned with developing new numerical techniques to solve large scale linear and nonlinear programming problems. Early work focused on sequential quadratic programming techniques for nonlinear programming. Subsequently, all work was focused on interior point methods for large scale linear and nonlinear programming. Initially, the focus of the research was on both dual-affine and primal-dual algorithm for linear programming. Substantial computational experience demonstrated the superiority of the primal-dual methods, and subsequent research focused on improving the efficiency of these methods, both by adding higher order methods via predictor-corrector techniques and by improving the linear algebra to take advantage of both sparsity and machine architecture. Most recently, research has focused on large scale quadratic programming. A primal-dual predictor-corrector method has been devised and shown to be very promising computationally for problems with diagonal or sparsely structured Hessian matrices. For problems with dense Hessians, a pure primal conjugate projected gradient algorithm shows promise on small problems. It remains to be tested on large-scale problems.

DESCRIPTORS: (U) *LINEAR PROGRAMMING, *NONLINEAR PROGRAMMING, *NUMERICAL METHODS AND PROCEDURES, *OPTIMIZATION, ALGEBRA, ALGORITHMS, ARCHITECTURE.

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AD-A248 578 CONTINUED

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CALIFORNIA UNIV BERKELEY DEPT OF PSYCHOLOGY

(U) Visual Perception of Features and Objects.

DESCRIPTIVE NOTE: Annual rept. 15 Sep 90-14 Sep 91.

SEP 91 21P

PERSONAL AUTHORS: Treisman, Anne M.

CONTRACT NO. AFOSR-90-0370

PROJECT NO. 2313, RR42

TASK NO. A4, O9

MONITOR: AFOSR, XF
TR-92-0265, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The research can be divided into work on (1) preattentive visual processing, and (2) work on visual memory and priming for previously perceived objects. Some of the main findings were as follows: (1) We showed that parallel, preattentive processing of motion and orientation depends on the elements sharing the same direction of contrast. However, some cues to occlusion appears also to be available preattentively, since they can control the correspondence matching in apparent motion. Preattentive grouping can guide attention in patients with neglect even though the elements are not consciously available. (2) Token representations of two novel objects can apparently be formed in a single trial. Attention then selects one of the two for response and inhibits the other. Its memory trace may nevertheless remain available to prime or interfere with subsequent perception of the same object. Similar priming and interference effects in visual search suggest that practice and automation may also depend on specific memory traces for each display, and that these are affected by the type of perceptual processing required by the search task.

DESCRIPTORS: (U) *VISUAL PERCEPTION, ATTENTION, AUTOMATION, CONTRAST, CONTROL, INTERFERENCE, MATCHING, MOTION, PATIENTS, PERCEPTION, PROCESSING, RESPONSE, SHARING, WORK.

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CALIFORNIA UNIV IRVINE DEPT OF CHEMISTRY

TEXAS UNIV AT DALLAS

(U) Synthesis and Study of Metallonitride Complexes and Polymers.

(U) Neostriatal Neuronal Activity and Behavior.

DESCRIPTIVE NOTE: Final rept. 1 Jan-30 Nov 91,

DESCRIPTIVE NOTE: Final rept. 1 Mar 90-28 Feb 92.

MAR 92 7P

FEB 92 3P

PERSONAL AUTHORS: Doherty, Nancy M.

PERSONAL AUTHORS: Woodward, Donald J.

CONTRACT NO. AFOSR-91-0179

CONTRACT NO. AFOSR-90-0146

MONITOR: AFOSR, XF

TR-92-0224, AFOSR

TASK NO. A4

PROJECT NO. 3484

UNCLASSIFIED REPORT

ABSTRACT: (U) The synthesis and chemistry of compounds in which two transition metal centers are bridged by a single nitrogen atom, the bridging nitride ligand, has been investigated. These studies have focused on understanding the chemical and physical properties of the M(N)M unit in order to explore its use as a building block for new transition metal-containing polymers. The approach to this chemistry has involved parallel exploration of molecular nitride-bridged species, which serve as model systems for developing the chemistry of these compounds, and of extended structures incorporating metal-nitrogen-metal linkages. Supporting studies on the reactivity and spectroscopy of silylimido precursor compounds, which are used in the synthetic route to nitride-bridged structures, have been performed. Extension of this chemistry to phosphide-bridged species has been explored. Transition metal, Nitride, Phosphide, Inorganic compounds, Inorganic polymers.

DESCRIPTORS: (U) *NITRIDES, *POLYMERS, *TRANSITION METALS, *SYNTHESIS(CHEMISTRY), *METAL COMPLEXES, ATOMS, CHEMICALS, CHEMISTRY, LIGANDS, METALS, MODELS, NITROGEN, PHYSICAL PROPERTIES, SYNTHESIS, PHOSPHIDES, INORGANIC POLYMERS.

IDENTIFIERS: (U) *Metalloniitride complexes.

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ABSTRACT: (U) The second year of the project allowed major tasks to be completed in the evolution of the advanced technology required for this project. A continual interchange of concepts and technology was made possible by the coordination of the three projects of the University Initiative Program at Hahnemann University (Dr John Chapin) and at Bowman Gray Medical School (Dr Samuel A. Deadwyler). The goal was to evolve a system for acquisition of a large ensemble of neuron spike trains from connected brain regions in awake behaving rats. Summary: Overall, the three projects have created a foundation of new methodology to promote the next decade of research on large-scale recording of ensemble neuron spike trains. We intend to apply these capabilities to studies of neural circuit models of cognition and long term responses to stress. The experimental aims of the project will be considered exclusively in the third year.

DESCRIPTORS: (U) *NERVE CELLS, ACQUISITION, BRAIN, CIRCUITS, COGNITION, METHODOLOGY, MODELS, RATS, REGIONS, SCALE, SPIKES, UNIVERSITIES.

IDENTIFIERS: (U) PE61103D, WUAFOSR3484A4.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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AD-A248 572 CONTINUED

MASSACHUSETTS INST OF TECH CAMBRIDGE CENTER FOR SPACE RESEARCH

Interactions. Theoretical Geoplasma Physics, URI Program.

DESCRIPTORS: (U) *GEOPHYSICS, *RESEARCH MANAGEMENT, AIR FORCE, INTERACTIONS, LABORATORIES, MISSIONS, ORGANIZATIONS, PHASE, PHYSICS, SPACE TECHNOLOGY, SPACE SCIENCES, THEORY, AURORAE, IONOSPHERIC DISTURBANCES, TRANSPORT PROPERTIES, PLASMAS(PHYSICS).

DESCRIPTIVE NOTE: Rept. for 15 Jan 91-14 Jan 92,

IDENTIFIERS: (U) PE61103D, WJAFOSR3484HS, Magnetotail, Ionospheric magnetosphere coupling, Plasma transport.

FEB 92 114P

PERSONAL AUTHORS: Chang, Tom

CONTRACT NO. AFOSR-90-0085

PROJECT NO. 3484

TASK NO. HS

MONITOR: AFOSR, XF
TR-92-0230, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This annual report contains a detailed description of the activities, accomplishments, and research progress of the MIT Center for Theoretical Geoplasma Physics established under the University Research Initiative Program by AFOSR. During this second phase of the program, the Center has made definite strides toward the goals prescribed in the renewal proposal. The Center has now a staff of twenty-five (25) faculty, research scientists, postdoctoral, graduate and undergraduate students and visiting scientists. Members of the Center published forty-eight (48) scientific papers and five (5) books and proceedings, delivered forty (40) invited lectures and fifty-one (51) contributed papers. We have initiated a number of new research activities to complement our other ongoing research programs. Some of our research efforts have already been utilized by Dr J.R. Jasperse's group at the Geophysics Directorate of the Phillips Laboratory in practical space technology applications relevant to the missions of the Air Force. In addition to the Phillips Laboratory, the Center has interacted with numerous research organizations and universities. The research publications are generally the direct product of such

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PARIS-11 UNIV ORSAY (FRANCE) LAB DE PHYSICO-CIMIE DES
RAYONNEMENTS

(U) Measurement of Radiative Lifetimes of Vibrational
States of Simple Ions.

DESCRIPTIVE NOTE: Final rept. Sep 87-Oct 91,

DEC 91

9P

PERSONAL AUTHORS: Marx, Rose; Maucilaire, Gerard

CONTRACT NO. AFOSR-87-0390

MONITOR: AFOSR, XF
TR-92-0196, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) A unique differentially pumped triple cell FT/ICR machine, where production of the ions, storage in a high vacuum trap for variable relaxation times and chemical monitoring of the internal energy content of the ions are separated as well in space as in time, has been shown to be well suited for experimental determination of radiative lifetime of ions. The monitor ion technique relies on the availability of energetically appropriate ion molecule processes, usually charge or proton transfer reactions. When several levels are populated, only overall lifetimes can be experimentally determined and correction of the raw data for radiative cascade is needed to get individual lifetimes. The reliability of this technique has been demonstrated for $\text{NO}^+(\text{X}, v=1-4)$ where accurate ab-initio calculations exist. For $\text{HCl}^+/\text{DCI}^+(\text{X}, v=1)$ the agreement with theoretical calculation is reasonable. For polyatomic ions our method can only indicate the presence and measure the relaxation rate of the amount of energy needed to drive the monitor reaction. However this proved quite valuable in the case of the acetone ion, revealing the unexpected possibility to store a substantial amount of internal energy for HCO^+ , H_2O^+ , NH_3^+ , our preliminary results have to be confirmed and completed with the newly improved experimental set-up. Reduction of collisional quenching in the relaxation cell by a double differential pumping will allow measurements of lifetimes up to approximately one second. Lifetimes, Vibrational states, Electronic

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DESCRIPTORS: (U) *IONS, *MONITORING, *PUMPING, ACETONES, AGREEMENTS, AVAILABILITY, CELLS, CHEMICALS, CORRECTIONS, DETERMINATION, DRIVES, ELECTRONICS, ENERGY, HIGH VACUUM, INTERNAL, MACHINES, MOLECULES, MONITORS, PRODUCTION, PROTONS, QUENCHING, RATES, REACTIVITIES, REDUCTION, RELAXATION, RELIABILITY, STORAGE, STORES, TIME, TRANSFER, TRAPS, VACUUM, VARIABLES.

IDENTIFIERS: (U) PE61102F.

metastable states, Reactivity.

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STANFORD UNIV CA DEPT OF PSYCHOLOGY

VIRGINIA POLYTECHNIC INST AND STATE UNIV BLACKSBURG DEPT
OF MATHEMATICS

(U) Induced Pictorial Representations.

(U) Computational Methods for Modeling and Active Control
of Distributed Parameter Systems.DESCRIPTIVE NOTE: Annual technical rept. 1 Feb 91-31 Jan
92.

DESCRIPTIVE NOTE: Final rept. 1 Dec 88-30 Nov 91,

FEB 92 11P

MAR 92 12P

PERSONAL AUTHORS: Tversky, Barbara G.

PERSONAL AUTHORS: Burns, J. A.; Cliff, E. M.

CONTRACT NO. AFOSR-89-0076

CONTRACT NO. AFOSR-89-0001

PROJECT NO. 2313

PROJECT NO. 2304

TASK NO. A4

TASK NO. A1

MONITOR: AFOSR, XF
TR-92-0231, AFOSRMONITOR: AFOSR, XF
TR-92-0239, AFOSR

UNCLASSIFIED REPORT

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ABSTRACT: (U) On many occasions, such as giving directions, spatial situations are described in words rather than depicted. In comprehending such descriptions, people form mental representations of the situation described by the discourse as well as representations of the text. This project investigates spatial mental models induced by words for large-scale and for immediate environments. The results simultaneously illuminate spatial thinking, text comprehension and text construction. The experiments using large-scale environments focus on the comprehension and production of various kinds of descriptive text. The experiments using immediate environments focus on on-line use of spatial mental models and updating under changes in point of view. New research is expanding both projects, including investigations of construction of mental models.

DESCRIPTORS: (U) *MAPS, *MENTAL ABILITY, *SPATIAL DISTRIBUTION, COGNITION, COMPREHENSION, CONSTRUCTION, ENVIRONMENTS, MODELS, PROCESSING, PRODUCTION, SCALE, VISUAL PERCEPTION, TEST CONSTRUCTION(PSYCHOLOGY).

IDENTIFIERS: (U) Mental models, Visual cognition, Mental maps, Discourse processing, PE61102F, WUAFOSR2313A4.

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IDENTIFIERS: (U) PEB1102F, WJAFDSR2308BS, Vortex
combustion, *Shear layers, *Hypersonic combustion...

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CALIFORNIA INST OF TECH PASADENA

(U) Shock Enhancement and Control of Hypersonic Combustion.

DESCRIPTIVE NOTE: Annual technical rept. 1 Apr 90-30 Mar
91.

NOV 91 17P

PERSONAL AUTHORS: Marble, Frank E.

CONTRACT NO. AFOSR-90-0188

PROJECT NO. 2308

TASK NO. BS

MONITOR: AFOSR, XF
TR-92-0238, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Shock tube studies of shock enhanced mixing of helium into air were reported utilizing the Rayleigh scattering technique. Because of the greater sensitivity in the low concentration range, these measurements were believed to be more accurate than those obtained with laser induced fluorescence. The result indicated that mixing was more rapid and more complete than reported previously. Preliminary work on the consequence of multiple shocks has been promising. Work began on the interaction of shock induced mixing with shear layers in the GALCIT $M = 2.5$ supersonic wind tunnel. Experiments concerning the details of combustion in large vortices in the Caltech Unsteady Combustion Facility progressed very well using simultaneous measurements of pressure, shadowgraphy, and chemiluminescence. These results reveal a very different ignition mechanism and combustion pattern than had been anticipated.

DESCRIPTORS: (U) *SHOCK TUBES, *SUPERSONIC COMBUSTION, AIR AUGMENTATION, CHEMILUMINESCENCE, COMBUSTION, CONTROL, FACILITIES, FLUORESCENCE, LASERS, LAYERS, METAMORPHIC ROCK, MIXING, PATTERNS, PRESSURE, RAYLEIGH SCATTERING, SCATTERING, SENSITIVITY, SHOCK, SUPERSONIC WIND TUNNELS, TUNNELS, VORTICES, WIND, WIND TUNNELS, WORK, HELIUM, IGNITION, INTERACTIONS, LASER INDUCED FLUORESCENCE.

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MARQUETTE UNIV MILWAUKEE WI

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receivers, Brightness temperature

(U) Detecting Microwave Emissions from Terrestrial Sources:
A Feasibility Study.

DESCRIPTIVE NOTE: Final technical rept. 1 Oct 88-31 Dec
91.

FEB 92 14P

PERSONAL AUTHORS: Ehler, Thomas C.; Ishii, Thomas K.

CONTRACT NO. AFOSR-88-0257

PROJECT NO. 2308

TASK NO. CS

MONITOR: AFOSR, XF
TR-92-0237, AFOSR

UNCLASSIFIED REPORT

Microwave Dicke Absorption Heterodyne Waveguide

ABSTRACT: (U) A Dicke receiver has been designed and constructed in our effort to detect the 22 GHz spontaneous emission from water vapor. The receiver compares the brightness temperatures of two waveguides, one containing gaseous H₂O at low pressure, the other containing dry air. Each waveguide is terminated with polished brass, which provides a low background brightness temperature, at one end and connects to the input of the receiver at the other end. The system is capable of detecting a brightness temperature difference of about 0.2 deg K. In this experiment, the radiation from water vapor produced the brightness temperature difference between source and reference of 0.28 to 0.33 deg K. The experimental results proved that emission from water vapor was being detected.

DESCRIPTORS: (U) *WATER VAPOR, *MICROWAVE EQUIPMENT, *EMISSION SPECTRA, AIR, BACKGROUND, BRASS, BRIGHTNESS, EMISSION, FEASIBILITY STUDIES, INPUT, LOW PRESSURE, MICROWAVES, PRESSURE, RECEIVERS, SOURCES, TEMPERATURE, WAVEGUIDES, RADIATION ABSORPTION.

IDENTIFIERS: (U) PEB1102F, WUAFOSR2308CS, Dicke

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GORDON RESEARCH CONFERENCES INC KINGSTON RI

VIRGINIA UNIV CHARLOTTESVILLE DEPT OF APPLIED MATHEMATICS

(U) Gordon Research Conference on Barrier Function of Mammalian Skin.

(U) Increasing the Margin of Stability of Arbitrarily Finite Modes of Flexible Large Space Structures with Damping.

DESCRIPTIVE NOTE: Final rept. 1 Jul-31 Dec 91.

DEC 91 31P

DESCRIPTIVE NOTE: Final technical rept. 1 Dec 89-31 Aug 91,

PERSONAL AUTHORS: Potts, Russell O.

FEB 91 12P

CONTRACT NO. AFOSR-91-0290

PERSONAL AUTHORS: Lasiecka, I.; Triggiani, R.

PROJECT NO. 2312

CONTRACT NO. AFOSR-90-0347

TASK NO. A5

PROJECT NO. 2304

MONITOR: AFOSR, XF
TR-92-0261, AFOSR

TASK NO. A3

UNCLASSIFIED REPORT

MONITOR: AFOSR, XF
TR-92-0227, AFOSR

ABSTRACT: (U) The objective of this conference was to bring together scientists so they could exchange recent research results and the conference provided a mechanism for the development of close interactions between these scientists. The quality of all of the lectures was exceptionally high and considerable discussion followed each lecture. Many of the conferees expressed very favorable comments about the intellectual stimulation provided by this conference.

DESCRIPTORS: (U) *SYMPOSIA, *MAMMALS, INTERACTIONS, LECTURES, SCIENTISTS, SKIN(ANATOMY).

IDENTIFIERS: (U) Barrier functions, *Address lists.

UNCLASSIFIED REPORT

ABSTRACT: (U) New results have been obtained on nonlinear wave equations and plate equations. These results include exact controllability, strong and uniform stabilization, structural damping, quadratic optimal control problem, Riccati equation, robustness with respect to nonlinear uncertainties, on numerical aspects of the operator Riccati Equation. Both boundary control and point control problems have been considered.

DESCRIPTORS: (U) *DAMPING, *SPACE SYSTEMS, *FLEXIBLE STRUCTURES, BOUNDARIES, CONTROL, EQUATIONS, PLATES, RICCATI EQUATION, STABILITY, STABILIZATION, STRUCTURES, WAVE EQUATIONS, APPLIED MATHEMATICS.

IDENTIFIERS: (U) WUAFOSR2304A3, PE61102F.

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ILLINOIS UNIV AT URBANA DEPT OF PSYCHOLOGY

(U) Reminding-Based Learning.

DESCRIPTIVE NOTE: Annual technical rept. 21 Jun 91-20 Jan 92.

FEB 92

14P

PERSONAL AUTHORS: Ross, Brian H.

CONTRACT NO. AFOSR-89-0447

PROJECT NO. 2313

TASK NO. A4

MONITOR: AFOSR, XF
TR-92-0232, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) When learning new cognitive skills involving problem solving, novices are often reminded of earlier problems. The use of earlier problems is a common means of problem solving and affects the learning of this skill. This project has three aims in understanding this learning. First, the representation of the resulting generalizations is being examined. Generalization formed from reminders are likely to be conservative, in that they may be more tied to the examples than many current theories allow. A main aim of the project is to distinguish and test different forms of this conservatism. Second, the development of problem solving expertise is examined by focusing on differences in how typical and atypical problems are solved. Third, the effects of such reminding-based learning in everyday problem solving is examined to extend the findings and test some theoretical ideas that are difficult to investigate in more formal domains.

DESCRIPTORS: (U) *LEARNING, *PROBLEM SOLVING, *SKILLS, FOCUSING, MEMORY (PSYCHOLOGY), EXPERIMENTAL PSYCHOLOGY.

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MINNESOTA UNIV MINNEAPOLIS INST FOR MATHEMATICS AND ITS APPLICATIONS

(U) Scientific Description of Summer Semiconductor Program.

DESCRIPTIVE NOTE: Final rept. 15 Nov 88-14 Nov 91,

MAR 91

29P

PERSONAL AUTHORS: Friedman, Auner

CONTRACT NO. AFOSR-89-0165

PROJECT NO. 2304

TASK NO. A9

MONITOR: AFOSR, XF
TR-92-0240, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The grant helped to support the IMA summer program Semiconductors, held July 15-August 9, 1991. This was an intensive, interdisciplinary program which involved many of the leaders in the field. The proceedings will be published in the series IMA Volumes in Mathematics and its Applications (Springer-Verlag).

DESCRIPTORS: (U) *MATHEMATICAL MODELS, GRANTS, MATHEMATICS, SEMICONDUCTORS, SUMMER, ABSTRACTS, MODELS, COMPUTATIONS, MILITARY RESEARCH.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A9, Summer semiconductor program, interdisciplinary research, Analysis.

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OHIO STATE UNIV COLUMBUS COLL OF PHARMACY

(U) Xenobiotic Kinetics and Toxicity among Fish and Mammals.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2312A4, *Toxicology, Lindane, Pentachlorophenol, Paraxon, *Trout, Toxic agents, Mammals, Fishes, *Pharmacokinetics, *Xenobiotics.

DESCRIPTIVE NOTE: Annual progress rept. 1 Aug 90-29 Feb 92.

FEB 92 16P

PERSONAL AUTHORS: Hayton, William

CONTRACT NO. AFOSR-90-0349

PROJECT NO. 2312

TASK NO. A4

MONITOR: AFOSR, XF
TR-92-0213, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The purpose of this project is to develop techniques that account for interspecies differences in the pharmacokinetics of xenobiotics. The hypothesis proposed is that toxicity occurs after exposure of the target organ to a characteristic concentration of toxicant for a particular period of time. To test the hypothesis, experiments are proposed to characterize the pharmacokinetics of three representative chemicals (lindane, pentachlorophenol and paraxon) in small trout via water exposure, and large trout and rats via intravascular injection. Compartmental pharmacokinetic models will be used. The fraction of a dose of each test compound converted to each of its metabolites by the test animals will be determined to account for possible metabolic differences that might contribute to interspecies differences in toxicity. Binding of the test substances in blood to formed elements and plasma proteins will also be characterized.

DESCRIPTORS: (U) ANIMALS, BLOOD, BLOOD PROTEINS, BLOOD VESSELS, CHEMICALS, EXPOSURE (GENERAL), HYPOTHESES, INJECTION, INSECTICIDES, MAMMALS, METABOLITES, MODELS, NITROPHENOLS, ORGANS (ANATOMY), PHARMACOKINETICS, PHOSPHATES, RATS, TARGETS, TEST AND EVALUATION, TIME, TOXICITY, TROUT, WATER.

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TEXAS UNIV AT AUSTIN DEPT OF PSYCHOLOGY

GE AIRCRAFT ENGINES CINCINNATI OH

(U) Individual Differences in Memory Decay and Retention.

(U) Slip Systems in (001) Oriented N1Al Single Crystals,

DESCRIPTIVE NOTE: Annual rept. 1 Oct 90-30 Sep 91,

91 10P

SEP 91 4P

PERSONAL AUTHORS: Young, Robert K.

PERSONAL AUTHORS: Field, R. D.; Lahrman, D. F.; Darolita, R.

CONTRACT NO. AFOSR-91-0014

CONTRACT NO. F49620-88-C-0052

PROJECT NO. 2313

MONITOR: AFOSR, XF
TR-92-0184, AFOSR

TASK NO. A7

UNCLASSIFIED REPORT

MONITOR: AFOSR, XF
TR-92-0205, AFOSR

Availability: Pub. in Acta Metall. Mater., v39 n12 p2951-2959 1991. Available only to DTIC users. No copies furnished by NTIS.

UNCLASSIFIED REPORT

DESCRIPTORS: (U) , DECAY, MEMORY DEVICES.

ABSTRACT: (U) An investigation of the change in slip behavior in N1Al with temperature has been conducted, with special emphasis on the 'hard' orientation. Single crystal specimens have been deformed in tension and compression and orientations and extensive dislocation analysis performed in the TEM on the oriented specimens. It was found that, although slip can occur in RT compression of oriented specimens, the increased tensile ductility observed at higher temperatures is due to the glide of dislocations. The debris left behind by these dislocations consists of dislocations, making identification of the operative Burgers vector difficult after any appreciable plastic strain. A mechanism for the formation of the debris is presented.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A7, Memory(Psychology), Memory decay, Memory retention, Cognitive abilities, Individuals, Research facilities.

DESCRIPTORS: (U) , COMPRESSION, DEBRIS, DISLOCATION, DUCTILITY, HIGH TEMPERATURE, ORIENTATION(DIRECTION), PLASTIC PROPERTIES, SINGLE CRYSTALS, STRAIN(MECHANICS), TENSILE PROPERTIES.

IDENTIFIERS: (U) Reprints, *Nickel aluminate, *Deformation, Dislocations, Ductility, *Crystals.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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VERMONT UNIV BURLINGTON DEPT OF COMPUTER SCIENCE AND ELECTRICAL ENGINEERING

NORTH CAROLINA UNIV AT CHAPEL HILL

(U) Asymptotic Description of Ultrashort Electromagnetic Pulse Propagation in a Linear, Casually Dispersive Medium.

(U) Spatiotemporal Characteristics of Human Visual Localization.

DESCRIPTIVE NOTE: Final rept. 1 May 89-31 Dec 91,

DESCRIPTIVE NOTE: Final rept. 1 May 89-31 Dec 91,

FEB 92 62P

91 29P

PERSONAL AUTHORS: Oughstun, Kurt E.; Laurens, Judith E.

PERSONAL AUTHORS: Burbeck, Christina A.

CONTRACT NO. F49620-89-C-0057

CONTRACT NO. AFOSR-0058

TASK NO. 57

TASK NO. A5

MONITOR: AFOSR, XF

MONITOR: AFOSR, XF
TR-92-0203, AFOSR

TR-92-0183, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

Availability: Pub. in Radio Science, v26 n1 p245-258 Jan-Feb 91. Available only to DTIC users. No copies furnished by NTIS.

Reprint: Asymptotic Description of Ultrashort Electromagnetic Pulse Propagation in a Linear, Casually Dispersive Medium.

DESCRIPTORS: (U) *ELECTROMAGNETIC WAVE PROPAGATION, *SHORT PULSES, DISPERSING, ASYMPTOTIC SERIES, FOURIER ANALYSIS, LINEAR SYSTEMS, PULSE MODULATION, REPRINTS.

IDENTIFIERS: (U) PE62202F, WUAFOSR617757.

ABSTRACT: (U) Psychophysical studies of the processes underlying relative localization in human vision were conducted. Specifically, the focus of this granting period was characterizing the spatial characteristics of the units that encode spatial location. Evidence was found for a higher-order scaled representation of position in which the size of position integration areas scales with the distance being encoded. This scaling of the position integration areas was found to account well for the increase in separation discrimination thresholds with increasing separation. The position integration areas were shown not to integrate luminance, but were shown to depend on an initial spatial organization of the scene. The time course of the position integration was also investigated. Additional studies investigated the relationship between position integration and the Muller-Lyer illusion, and the effect of the spatial frequency of a masking stimulus (presented at termination of the separation discrimination stimulus) on separation discrimination thresholds. Human vision, Visual psychophysics, Visual spatial localization, Position.

DESCRIPTORS: (U) *VISION, DISCRIMINATION, FREQUENCY, HUMANS, ILLUSIONS, INTEGRATION, LUMINANCE, MASKING, ORGANIZATIONS, PSYCHOPHYSICS, SEPARATION, TIME.

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SEARCH CONTROL NO. T85005

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ILLINOIS UNIV AT URBANA COORDINATED SCIENCE LAB

CALIFORNIA UNIV SANTA BARBARA DEPT OF ELECTRICAL AND
COMPUTER ENGINEERING

(U) Nonlinear System Design: Adaptive Feedback
Linearization with Unmodeled Dynamics.

(U) Numerical Methods for Closed-Loop Control.

DESCRIPTIVE NOTE: Final rept. 1 Oct 89-30 Sep 91.

DESCRIPTIVE NOTE: Final rept. 15 Dec 88-14 Jun 91.

SEP 91 44P

JUN 91 27P

PERSONAL AUTHORS: Kokotovic, Peter V.

PERSONAL AUTHORS: Laub, Alan J.

CONTRACT NO. AFOSR-90-0011

CONTRACT NO. AFOSR-89-0167

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A1

TASK NO. A1

MONITOR: AFOSR, XF

MONITOR: AFOSR, XF

TR-92-0215, AFOSR

TR-92-0185, AFOSR

UNCLASSIFIED REPORT

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ABSTRACT: (U) The main goal of this research is to develop a unified geometric-asymptotic-adaptive methodology for feedback design of nonlinear control systems. Such a methodology is needed because the existing differential geometric results are restrictive and often violated by small modeling errors. Effects of these errors can be analyzed asymptotically by singular perturbation methods, which however, are still lacking a clear geometric interpretation. Neither geometric, nor perturbational problem formulations can cope with large parametric uncertainty, for which an adaptive approach seems suitable. Conversely, both geometric and asymptotic techniques are to be merged into a methodology which eliminates their individual shortcomings.

DESCRIPTORS: (U) *CONTROL SYSTEMS, *FEEDBACK, APPROACH, CONTROL, ERRORS, FORMULATIONS, METHODOLOGY, UNCERTAINTY.

IDENTIFIERS: (U) Nonlinear control systems.

ABSTRACT: (U) The primary objective of this research has been to develop algorithms for large scale computational problems arising in control, filtering, and system theory. Much work has concentrated on matrix Riccati equations which are absolutely fundamental, but a range of other topics in control design have also been attacked.

DESCRIPTORS: (U) *MATHEMATICAL FILTERS, *CONTROL THEORY, ALGORITHMS, CONTROL, EQUATIONS, FILTRATION, THEORY, WORK, RICCATI EQUATION.

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MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF BRAIN AND
COGNITIVE SCIENCES

(U) Top-Down Influences on Bottom-Up Processing.

DESCRIPTIVE NOTE: Annual rept. 20 Sep 90-19 Sep 91.

FEB 92 9P

PERSONAL AUTHORS: Richards, Whitman

CONTRACT NO. AFOSR-89-0504

PROJECT NO. 2313

TASK NO. A9

MONITOR: AFOSR, XF
TR-92-0191, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Perception is not simply a bottom-up process, but involves inductive inferences that use top-down knowledge to interpret image data. In computational vision, typically this knowledge appears in the form of constraints such as rigidity, viewpoint consistency, smoothness, etc. However these constraints are fallible - they do not always apply, and hence the perceptual process entails inductive reasoning. A major theoretical thrust of our work is to provide a formal lattice framework for organizing the plausible states of this reasoning aspect of perception (Jepson & Richards). The proposal makes strong predictions, given a set of constraints and a particular picture as to what interpretations or percepts will be seen. Consequently we have a series of experiments underway to (1) understand which constraints (or premises) are typically invoked in the interpretation of simple line drawings and (2) to show that the lattice framework specifies all of these interpretations, placing them in proper rank order. In parallel, we are also exploring two other models for merging bottom-up and top-down information, both of which are neural-based. One, called sequence-seeking (Ullman), proposes a network hierarchy where a sequence of transformations of both the input data and the target model occur in parallel, searching for the proper mapping that brings each into register. The proposal makes a

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special effort to incorporate what we currently know about cortical machinery, and also has triggered psychophysical experiments. (We have not yet explored the relations between the lattice and sequence-seeking proposals.) Finally, there are some studies related to our ability to switch between sets of premises, or to alter our models.

DESCRIPTORS: (U) , BOTTOM, COGNITION, CONSISTENCY, IMAGES, INPUT, MAPPING, MODELS, NETWORKS, NEUROPHYSIOLOGY, PERCEPTION, PICTURES, PREDICTIONS, PROCESSING, PSYCHOPHYSICS, REASONING, RIGIDITY, SEARCHING, SEQUENCES, SWITCHES, TARGETS, THRUST, TRANSFORMATIONS, VISION, WORK.

IDENTIFIERS: (U) Vision, AI, Cognition, Neurophysiology, Visual psychophysics, Dynamical systems, PE61102F, WUAFOSR2313A9.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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UDDEHOLM STEEL CORP TOTOWA NJ*

(U) Practical Method's for Robust Multivariable Control.

DESCRIPTIVE NOTE: Final rept. 1 Aug 89-31 Oct 91.

DEC 91 9P

PERSONAL AUTHORS: Safonov, Michael G.; Jonckheere, Edmond A.

CONTRACT NO. AFOSR-89 -0398

PROJECT NO. 2304

TASK NO. A1

MONITOR: XF, AFOSR
TR-92-0201, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The theme of the research has been making modern control theory work. The product of the research has been theory, algorithms and software applicable to multivariable feedback control problems in which there are design constraints requiring robust attainment of stability and control performance objectives in the face of both structured and unstructured uncertainty. Advances in the past two years have included relative-error methods for system identification, model reduction and control, better algorithms for H- and H2 control computations and new results on the analysis of stability robustness in the presence of several uncertain real parameters. Although the research has been aimed primarily at developing basic concepts, theory and methodology for robust control design, the theory that is emerging from the research is already beginning to play a significant role in facilitating the control design process in a variety of aerospace engineering applications where robust performance is prerequisite, including aircraft stability augmentation systems, highly maneuverable aircraft design, missile guidance systems, and precision pointing and tracking systems.

DESCRIPTORS: (U) *CONTROL THEORY, *MULTIVARIATE ANALYSIS, ALGORITHMS, AUGMENTATION, COMPUTATIONS, ENGINEERING, FEEDBACK, GUIDANCE, IDENTIFICATION, METHODOLOGY, MODELS,

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PARAMETERS, PRECISION, RECREATION, REDUCTION, STABILITY, THEORY, TRACKING, UNCERTAINTY, AERONAUTICAL ENGINEERING.

IDENTIFIERS: (U) Control theory, System identification, Model reduction, PE61102F, WUAFOSR2304A1, Robust procedures.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T85005

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WORCESTER POLYTECHNIC INST MA

(U) Integration of Stereo Vision and Optical Flow Using Energy Minimization Approach.

DESCRIPTORS: (U) *COMPUTER VISION, *ROBOTICS, BINOCULARS, BOUNDARIES, COMPUTERS, DEPTH, DISCONTINUITIES, EDGES, ENERGY, EQUATIONS, FLOW, FUNCTIONS, IMAGES, INPUT, INTENSITY, MODELS, MOTION, REGIONS, RELAXATION, SITES, THEORY, VISION, YIELD.

DESCRIPTIVE NOTE: Final rept. 15 Oct 89-14 Oct 91,

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304A7.

JAN 92 22P

PERSONAL AUTHORS: Nasrabadi, Nasser M.

CONTRACT NO. AFOSR-90-0041

PROJECT NO. 2304

TASK NO. A7

MONITOR: AFOSR, XF
TR-92-0186, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) A cooperative motion-stereo method is proposed where image intensity (brightness) and optical flow information are integrated into a single stereo technique by modeling the input data as coupled Markov Random Fields (MRF). The Bayesian probabilistic estimation method and the MRF-Gibbs equivalence theory are used to integrate the optical flow and the gray level intensity information to obtain an energy function which will explicitly represent the depth discontinuity and occlusion constraints on the solution. This energy function involves the similarity in intensity (or edge orientation) and the optical flow between corresponding sites of the left and right images as well as the smoothness constraint on the disparity solution. If a simple MRF is used to model the data, the energy function will yield a poor disparity by smoothing across object boundaries, particularly when occluding objects are present. We exploit optical flow information to indicate object boundaries (depth discontinuities) and occluded regions, in order to improve the disparity solution in occluded regions. A stochastic relaxation algorithm (Simulated Annealing) is used to find a favorable disparity solution by minimizing the energy equation. Stereo Vision, Computer Vision, Robotics, Stereo-Matching, Relaxation, Hough Transform, Binocular Stereo.

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TEXAS UNIV MEDICAL SCHOOL AT HOUSTON DEPT OF NEUROBIOLOGY
AND ANATOMY(U) Analysis and Synthesis of Adaptive Neural Elements and
Assemblies.COMPUTATIONS, COMPUTER PROGRAMS, COMPUTERS, CURRENTS,
DIFFUSION, FEEDING, INTENSITY, INTERACTIONS, MEMBRANES,
MODELS, MODULATION, MOTOR NEURONS, MOTORS, NERVE CELLS,
NETWORKS, PATTERNS, REFLEXES, SIMULATORS, STORAGE,
VOLTAGE, WORK.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2312A1.

DESCRIPTIVE NOTE: Annual rept. 1 Oct 90-30 Sep 91.

FEB 92 15P

PERSONAL AUTHORS: Byrne, John H.

CONTRACT NO. AFOSR-91-0027

PROJECT NO. 2312

TASK NO. A1

MONITOR: AFOSR, XF
TR-92-0212, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Between October 1, 1990 and September 30, 1991, progress was made in six areas. First, voltage-clamp experiments investigated the modulation of the voltage-dependent K⁺ current (I_K) by serotonin (5-HT). Second, a computer program that is a general-purpose Simulator for Neural Networks and Action Potentials (SNNAP) was developed. Third, extensions were made to the single-cell model of associative learning by incorporating Hodgkin-Huxley type membrane currents, descriptions of the modulation of membrane currents by 5-HT, and a model of intracellular Ca²⁺ diffusion. Fourth, SNNAP was used to investigate the role of interneurons in determining the intensity and duration of motor neuron responses that mediate the tail-withdrawal reflex. Fifth, experiments characterized the synaptic interactions among the neurons of a central pattern generator (CPG) that underlies aspects of feeding behavior. Sixth, SNNAP was used to begin simulating the neurons and synaptic connections of the feeding CPG. In addition, work on the model of the bursting neuron R15 was completed. Learning, Memory, Information Storage, Artificial Intelligence, Neuronal and Neural Network Computations.

DESCRIPTORS: (U) *INTELLIGENCE, *LEARNING, ADDITION,
ARTIFICIAL INTELLIGENCE, BEHAVIOR, CELLS, CLAMPS.

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DALHOUSIE UNIV HALIFAX (NOVA SCOTIA) DEPT OF PSYCHOLOGY

(U) Neurophysiological Analysis of Circadian Rhythm
Entrainment.

DESCRIPTIVE NOTE: Annual rept. 1 Jan-31 Dec 91.

DEC 91 6P

PERSONAL AUTHORS: Rusak, Benjamin

CONTRACT NO. AFOSR-90-0104

PROJECT NO. 2312

TASK NO. CS

MONITOR: AFOSR, XF
TR-92-0187, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) During the 1991 contract period we published papers on the effects of clorgyline treatment on photic responses of neurons in the circadian entrainment pathway, and on the effects of NMDA neurotransmitter antagonists on photic activation of gene expression in the entrainment pathway. We have completed further studies on regulation of messenger RNA levels for several immediate-early genes (IEG) in suprachiasmatic nucleus (SCN) cells in response to light pulses and on the effects of a non-NMDA antagonist on IEG expression in the SCN; the related manuscripts have been accepted for publication. Further studies have been completed and submitted for publication or are currently in preparation. These include studies on: the effects of different temporal patterns of light exposure on SCN cells and on rhythm phase-shifting; antagonism by serotonin of light effects on cells in the circadian system; the effects of bombesin-like peptides on SCN neuronal activity; the effects of several excitatory amino acids on SCN cells in vitro; the regulation of the melatonin sensitivity rhythm of SCN cells; and the roles of nerve growth factor and muscarinic receptor antagonists in modifying circadian responses to cholinergic agents. The results of these studies have either been submitted for publication or are in preparation.

DESCRIPTORS: (U) *NERVE CELLS, *ENTRAINMENT, *CIRCADIAN RHYTHMS, ACIDS, ACTIVATION, AMINO ACIDS, CELLS, CONTRACTS, DOCUMENTS, ENTRAINMENT, GENES, LIGHT, LIGHT PULSES, NERVES, NEUROTRANSMITTERS, PATTERNS, PEPTIDES, PHASE, PREPARATION, PULSES, REGULATIONS, RESPONSE, SENSITIVITY, SEROTONIN, SHIFTING.

IDENTIFIERS: (U) PE61102F, WUAFOSR2312CS, *Clorgyline treatment, Circadian entrainment pathway.

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PENNSYLVANIA UNIV PHILADELPHIA DEPT OF CHEMISTRY

ALABAMA UNIV IN BIRMINGHAM SCHOOL OF MEDICINE

(U) Synthesis of Novel High Energy Density Materials Using Nitrocarbenes.

(U) Cumulative Effect of Repeated Brief Cerebral Ischemia.

DESCRIPTIVE NOTE: Final rept. 1 Aug 90-31 Dec 91.

DESCRIPTIVE NOTE: Final rept. 15 Jun 90-14 Dec 91.

FEB 92 10P

DEC 91 22P

PERSONAL AUTHORS: Dailey, William P.

PERSONAL AUTHORS: Halsey, James H., Jr

CONTRACT NO. F49620-90-C-0046

CONTRACT NO. AFOSR-90-0269

PROJECT NO. 5730

PROJECT NO. 2312

TASK NO. 00

TASK NO. A5

MONITOR: AFOSR, XF

MONITOR: AFOSR, XF

TR-92-0207, AFOSR

TR-92-0198, AFOSR

UNCLASSIFIED REPORT

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ABSTRACT: (U) The objectives of this work which were fulfilled were to (1) use high level ab initio molecular orbital theory to predict the structures and energies of potential energetic molecules and to guide the synthesis of the more promising candidate molecules, (2) synthesize a number of potential molecules and provide samples to the Astronautics Laboratory for testing, and (3) modify existing polybutadiene binders and provide samples to the Astronautics Laboratory for testing. Several novel cyclopropenes were synthesized and are considered to be good candidates for novel high energy fuels. Cyclopropenes, High energy density materials, Ab initio calculations, Synthesis.

DESCRIPTORS: (U) *DENSITY, *HIGH ENERGY, *MATERIALS, *SYNTHESIS, ASTRONAUTICS, BINDERS, ENERGY, FUELS, LABORATORIES, MOLECULAR ORBITALS, MOLECULES, NUMBERS, POLYBUTADIENE, STRUCTURES, THEORY, WORK, ENERGETIC PROPERTIES.

IDENTIFIERS: (U) PE62302F, WUAFOSR573000, *Nitrocarbenes, Ab initio, Nitrocyclopropenes.

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ABSTRACT: (U) We have investigated the problem of Gz-induced blackout in an animal model in which controlled brief global cerebral ischemia is produced repeatedly at short intervals. The objective was to determine if this results in cumulative impairment of brain metabolism and electrical function and if so to identify the mechanisms involved. Our initial hypothesis was that accumulation of lactate may be an important element in this process. Rats were prepared for experiment under halothane anesthesia with tracheostomy, ligation of both subclavian arteries, cannulation of one femoral artery, and of one common carotid artery in cephalad direction. Both external carotid arteries were ligated. Both mouth and rectal temperatures were monitored with thermocouples and mouth temperature was maintained at 37.0 + or - 0.5 degrees Celsius. A balloon in cuff was placed around the remaining carotid artery. The rat was placed within the spectrometer magnet operating at 4.7 Telsa for lactate and phosphorous. Repeated brief episodes of global brain ischemia were made by temporary inflation of the carotid balloon while MR proton spectra are being acquired serially at intervals of 30 seconds using a 1 cm surface coil. We report results using a newly constructed doubly tuned probe enabling interleaved acquisition of 31 P (high energy phosphates and pH) and 1 H (lactate and amino acids). Different durations of ischemia and intervals between them were tested to determine

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thresholds for development of EEG impairment, tissue acidosis, high energy phosphate depletion, and lactate accumulation.

DESCRIPTORS: (U) *BRAIN, *CAROTID ARTERIES, *ISCHEMIA, ACCUMULATION, ACIDOSIS, ACQUISITION, ANESTHESIA, ANIMALS, ARTERIES, BALLOONS, CANNULATION, COILS, DEPLETION, ENERGY, EXTERNAL, FEMORAL ARTERIES, FUNCTIONS, GLOBAL, HIGH ENERGY, INTERVALS, LACTATES, MAGNETS, METABOLISM, MODELS, MOUTH, PHOSPHATES, PROBES, PROTONS, RATS, SPECTRA, SPECTROMETERS, TEMPERATURE, THERMOCOUPLES.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2312A5.

JAN 92 9P

PERSONAL AUTHORS: Willson, Robert F.; Asch/anden, Marcus J.; Benz, Arnold O.

CONTRACT NO. AFOSR-89-0147

PROJECT NO. 2311

TASK NO. A1

MONITOR: AFOSR, XF
TR-92-0193, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) We present observations of an XI flare detected simultaneously with the Very Large Array (VLA) the PHOENIX Digital Radio Spectrometer and the Burst and Transient Source Experiment (BATSE) aboard the Gamma Ray Observatory (GRO). The VLA was used to produce snapshot maps of the impulsive burst emission in the higher corona on timescales of 1.7 seconds at both 20 and 01 cm. Our results indicate electron acceleration several minutes before the onset of the hard X-ray burst detected by BATSE. Comparisons with high spectral and spatial observations by PHOENIX reveal a variety of radio drift at 20 cm, such as type III bursts, intermediate drift bursts, and quasi-periodic pulsations during different stages of the XI flare. From the drift rates of these radio bursts we derive information on local density scale heights, the speed of radio exciter, and the local magnetic field. Radio emission at 90 cm shows a type IV burst moving outward with a constant velocity of 240 km/sec. The described XI flare is unique in the sense that it appeared at the east limb (N06/E88) providing the most accurate information on the vertical structure of different flare tracers visible in radio wavelengths. Sun - X-rays, Sun - radio radiation, Sun - flares.

DESCRIPTORS: (U) *SOLAR X RAYS, *SOLAR FLARES, ACCELERATION, CONSTANTS, DENSITY, DRIFT, ELECTRONS, EMISSION, GAMMA RAYS, HARD X RAYS, MAGNETIC FIELDS, MAPS, RADIATION, RATES, RUPTURE, SCALE, SPECTROMETERS.

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STRUCTURES, SUN, TRANSIENTS, VELOCITY, SOLAR CORONA.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2311A1, BATSE(Burst and Transient Source Experiment), VLA(Very Large Array).

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BOWMAN GRAY SCHOOL OF MEDICINE WINSTON-SALEM NC

(U) Multiple Neuron Recording in the Hippocampus of Freely Moving Animals.

DESCRIPTIVE NOTE: Annual progress rept. 1 Dec 90-30 Nov 91.

FEB 92 5P

PERSONAL AUTHORS: Deadwyler, Sam A.

REPORT NO. BGSM-PP-91-001

CONTRACT NO. AFOSR-90-0092

PROJECT NO. 3484

TASK NO. HS

MONITOR: AFOSR, XF
TR-92-0190, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Progress over the last year on the development of multineuronal recording systems has been significant. Since this was one of the main objectives of the consortium of three laboratories it has been a principle focus of the past years research efforts. This phase is near completion and currently being implemented in several research projects. Consequently most of the research effort in the past year has been directed toward these technological accomplishments. However in addition to the strides made in bringing the multineuronal and multi-tasking computer systems to completion, several studies which were in preliminary stages at the time of submission are now near completion and are being prepared for publication. Specifically, these include the signal detection task and the DMTS task in which complex neurophysiological analyses have revealed striking new relationships to sensory processing strategies in the hippocampus and cortex. The accompanying report summarizes these and other accomplishments in the second year of the award.

DESCRIPTORS: (U) *HIPPOCAMPUS, ADDITION, AWARDS, COMPUTERS, CONSORTIUMS, DETECTION, DOCUMENTS.

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LABORATORIES, PHASE, PROCESSING, RECORDING SYSTEMS,
SIGNALS, TIME.

MASSACHUSETTS UNIV AMHERST DEPT OF PHYSICS AND ASTRONOMY

(U) Observational Study and Analysis of Point Sources
Found by the Infrared Astronomy Satellite.

IDENTIFIERS: (U) PE61103D, WUAFOSR3484HS.

DESCRIPTIVE NOTE: Final technical rept. 1 Dec 87-30 Apr
91.

APR 91 15P

PERSONAL AUTHORS: Kleinmann, S. G.

CONTRACT NO. AFOSR-88-0070

PROJECT NO. 2311

TASK NO. A1

MONITOR: AFOSR, XF
TR-92-0194, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Results are presented of studies of the space distribution and other properties of two significant classes of compact astrophysical sources which are bright at midinfrared wavelengths: stars with excess infrared emission due to heated dust, and galaxies with nuclei that heat surrounding dust to anomalously high temperatures. The stellar studies reveal a complex structure for the galactic disk, which must be taken into account in the development of realistic infrared sky models. The extragalactic studies have been temporarily stalled by the remarkable discovery of low-luminosity stars with strong far-infrared spectral energy distributions mimicking warm galaxies. Much further observational work is needed to understand the origin of this emission.

DESCRIPTORS: (U) *STARS, DISKS, DISTRIBUTION, DUST, EMISSION, ENERGY, GALAXIES, HEAT, LUMINOSITY, MODELS, NUCLEI, SKY, SOURCES, STRUCTURES, WORK.

IDENTIFIERS: (U) PE61102F, WUAFOSR2311A1.

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CALIFORNIA UNIV IRVINE DEPT OF CHEMISTRY

CALIFORNIA UNIV SAN DIEGO DEPT OF MEDICINE

(U) Kinetics of Surface Reactions Studied by Laser
Desorption with FTMS Detection.

(U) Neural Basis of Motion Perception.

DESCRIPTIVE NOTE: Final technical rept. 1 Nov 88-31 Oct
90.

DESCRIPTIVE NOTE: Annual rept. 1 Apr 90-31 May 91.

JAN 92 2P

FEB 92 8P

PERSONAL AUTHORS: Ramachandran, V. S.

PERSONAL AUTHORS: Hemminger, John C.; McIver, Robert T.,
JR

CONTRACT NO. AFOSR-89-0414

CONTRACT NO. AFOSR-89-0019

PROJECT NO. 2313

PROJECT NO. 2303

TASK NO. A5

TASK NO. A2

MONITOR: AFOSR, XF

TR-92-0204, AFOSR

MONITOR: AFOSR, XF

TR-92-0197, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The mechanism of laser induced desorption has been investigated by comparing the wavelength and pulse energy dependence of laser desorption from thermally thin metal films of a variety of thicknesses. We are able to distinguish thermal versus non-thermal laser desorption mechanisms. Laser desorption, Fourier transform mass spectrometry, Non-thermal mechanisms.

DESCRIPTORS: (U) *LASERS, DESORPTION, ENERGY, FILMS, MASS, MASS SPECTROMETRY, METAL FILMS, METALS, PULSES, SPECTROMETRY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A2.

ABSTRACT: (U) Our goal is to understand the neural basis of perception and to test computational models of visual processing. This year we have been pursuing 3 lines of research: (1) we have been continuing our earlier studies on 'motion capture', shape from shading and stereopsis. Our research suggests that image segmentation (based on texture, occlusion can) profoundly influences the early visual processing of stereopsis, shape from shading and motion correspondence; (2) we have begun to investigate the 'filling in' of 'artificial scotomas' and of scotomas produced by brain injury. (Our goal has been to understand surface interpolation), and; (3) we have developed a new psychophysical technique for isolating and studying a fast contour system in human vision; a system that might correspond to the magnocellular pathway of physiologists.

DESCRIPTORS: (U) *HUMANS, *PERCEPTION, BRAIN, CONTOURS, IMAGES, MODELS, MOTION, PROCESSING, SHAPE, SURFACES, TEXTURE, VISION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A5.

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PURDUE UNIV LAFAYETTE IN JET PROPULSION CENTER

(U) Visual Psychophysics of Egomotion.

DESCRIPTORS: (U) *EYE MOVEMENTS, *HUMANS, *PERCEPTION,
COMPUTERS, CONSTANTS, ECCENTRICITY, EYE, IMAGES, MODELS,
MOTION, OBSERVERS, PATHS, SIMULATION, STIMULI, VELOCITY,
VOLUME.

DESCRIPTIVE NOTE: Annual rept. 1 Dec 90-30 Nov 91.

IDENTIFIERS: (U) PE61102F, WUAFDSR2313CS.

FEB 92 11P

PERSONAL AUTHORS: Turano, Kathleen

CONTRACT NO. AFOSR-91-0154

PROJECT NO. 2313

TASK NO. CS

MONITOR: AFOSR, XF
TR-92-0202, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Two psychophysical studies investigated an observer's ability to perceive self motion. In both studies, the stimuli were computer-generated images simulating an observer moving relative to a volume of randomly-positioned dots. The first study investigated an observer's ability to determine whether s/he was moving forward along a straight or curved path as forward speed was varied. The results showed that with eye movements, the deviation required to detect a departure from a straight path increased with forward speed. When eye movements were restricted, the required deviation remained constant across forward speeds. A second study investigated the effectiveness of various sizes and retinal locations of the stimulus in determining the direction of a curved path. The results showed an increasing linear relationship between optimal size and retinal eccentricity. Given optimally-scaled stimuli, the central and peripheral retinal locations yielded equivalent performance. Finally, a computational model has been developed to emulate a human observer's ability to detect a curved path of motion. Computer simulations of the model have been run on a task to discriminate between a curved and straight path of motion. The simulation results closely match psychophysical data. Egomotion. Motion perception, Curvilinear motion, Self motion perception, Eccentricity, Eye movements.

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TUFTS UNIV MEDFORD MA DEPT OF PHYSICS AND ASTRONOMY

(U) COMSTOC IV: Multiwaveband Observations of Sunspot and
 Plage-Associated Coronal Emission.

HARMONICS, HEIGHT, LOOPS, MAGNETIC FIELDS, MISSIONS,
OBSERVATORIES, POLARITY, RADIATION, REGIONS, STRUCTURES,
SUN, SUNSPOTS, TEMPERATURE, VALUE, VELOCITY, X RAYS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2311A1, *Solar Corona,
*Solar X Rays, Comstoc(Coronal Magnetic Structures
Observing Campaign).

DESCRIPTIVE NOTE: Interim rept..

JAN 92

37P

PERSONAL AUTHORS: Brosius, Jeffrey W.; Willson, Robert F.;
Holman, Gordon D.; Schmelz, Joan T.

CONTRACT NO. AFOSR-89-0147

PROJECT NO. 2311

TASK NO. A1

MONITOR: AFOSR, XF
TR-92-0192, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Simultaneous observations of an active region located near central meridian were obtained with the Very Large Array, the Solar Maximum Mission X-ray Polychromator, and the Beijing Observatory magnetograph on 18 December 1987, during the Coronal Magnetic Structures Observing Campaign (COMSTOC). An asymmetric loop-like structure connects the strong leading sunspot with a nearby region of opposite polarity. Both 6 and 20 cm emission lies along this structure, rather than over the sunspot, with higher frequency emission originating closer to the footpoint inside the sunspot. The 20 cm emission is due to a superposition of 2nd and 3rd harmonic gyroemission, where the field strength is 18- G- 300 G, while the 6 cm emission is due to the 3rd harmonic gyroemission from a region where the magnetic field strength ranges from 547 583 G. A high value of the Alfven speed of 40,000 km/sec. is obtained at the location of the 6 cm source, with somewhat lower values of 10,000 - 20,000 km/sec. at the location of the 20 cm emission. At the location of the 6 cm source, the plasma temperature diminishes with height from 2 500 000 K at 5000 km to 1 300 000 K at 15,000 km. Sun, Xorona, Sun - radio radiation, Sun - X-rays.

DESCRIPTORS: (U) ARRAYS, EMISSION, FREQUENCY.

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STANFORD UNIV CA DEPT OF PSYCHOLOGY

(U) Spontaneous Discovery and Use of Categorical Structures.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A4.

DESCRIPTIVE NOTE: Annual technical rept. 15 Jan 91-14 Jan 92.

FEB 92 40P

PERSONAL AUTHORS: Clapper, John P.; Bower, Gordon H.

CONTRACT NO. AFOSR-91-0144

PROJECT NO. 2313

TASK NO. A4

MONITOR: AFOSR, XF
TR-92-0195, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This research deals with unsupervised learning of categories (UL) and how such learning is affected by the sequencing of training instances. Two general models of UL are described, one based on learning explicit associations between correlated features (associative model), and the other based on creating distinct schemas to represent each category without explicit learning of feature correlations (schema-triggering model). An attribute listing paradigm was used as an index of UL in three experiments, each of which manipulated the order in which instances from two different categories were presented and evaluated the effects of this manipulation in terms of the two competing models of UL. Strong evidence was found for the use of a discrete schema-triggering process to learn the categories in these experiments. Moreover, these experiments demonstrate that the attribute listing paradigm can be used to trace learning functions for UL over a series of instances, enabling the future investigation of many independent variables using this task. Unsupervised learning, Category, Schema, Triggering, Attribute, Value, Feature, Default, Variable.

DESCRIPTORS: (U) *LEARNING, FUNCTIONS, INDEXES, MODELS, ORGANIZATIONS, TRAINING, VALUE, VARIABLES.

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COLUMBIA UNIV NEW YORK DEPT OF PSYCHOLOGY

results from change of G. Spatial localization, Pitch, Roll, Eye level, Visual localization, VPV, VPV, Perception, Egocentric spatial localization, Vertical.

(U) Visual Perception of Elevation.

DESCRIPTIVE NOTE: Annual rept. 1 Jan-31 Dec 91.

JAN 92 8P

DESCRIPTORS: (U) *DARK ADAPTATION, *HEAD (ANATOMY), *PERCEPTION, ADAPTATION, BIAS, CONSTANTS, DEPTH, DISCRIMINATION, ELEVATION, ENVIRONMENTS, EYE, FUNCTIONS, HUMANS, LIGHT, OBSERVERS, ROLL, SLOPE, STIMULI, TIME.

PERSONAL AUTHORS: Matin, Leonard

IDENTIFIERS: (U) PE61102F, WUAFSOR2313A9.

REPORT NO. 001

CONTRACT NO. AFOSR-91-0146

PROJECT NO. 2313

TASK NO. A9

MONITOR: AFOSR, XF
TR-92-0206, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The experiments demonstrate the importance for human observers of the retinal orientation and location of individual straight lines in determining (1) the physical elevation visually perceived as being at eye level (VPEL), and (2) the orientation within a frontal plane visually perceived as being vertical (VPV). The particular depth plane is unimportant for each discrimination as shown by experiments in which stimuli at the same retinal location from differently pitched and differently rolled planes of different depth influence each discrimination identically. The laws of spatial summation for lines controlling VPEL have been determined and are very different than for other visual discriminations: Influences for a parallel line set summate across a negatively accelerated exponential with a 15.10 space constant; lines from nonparallel sets make use of a mechanism that takes a weighted average of their individual influences. The time course for light and dark adaptation of VPEL for a 2-line stimulus is similar to that for a normally illuminated and fully structured pitched visual environment. The VPEL discrimination is near-spatiotopic for eye position and head orientation. The analysis of results at 1.5G has not yet been completed, but it appears that a bias with only minimal influence on the slope of the VPEL vs-pitch function

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PRINCETON UNIV NJ

Neurochemical afferents, Single unit activity,
Microiontophoresis, Glutamate, GABA, Attention, Arousal,
Bioreactivity, Sleep, Behavior.

(U) Physiological Analyses of the Afferents Controlling
Brain Neurochemical Systems.

DESCRIPTIVE NOTE: Annual rept. 1 Jun 90-31 May 91.

FEB 92 3P

DESCRIPTORS: (U) *NERVE CELLS, *NOREPINEPHRINE,
*SEROTONIN, ACTIVATION, ATTENTION, BEHAVIOR, BRAIN, CATS,
CONTROL, PHYSIOLOGY, RESPONSE, SITES, SLEEP, STIMULI.

IDENTIFIERS: (U) PE61102F, WUAF50R2312A2.

PERSONAL AUTHORS: Jacobs, Barry L.

REPORT NO. 255-6491-1

CONTRACT NO. AFOSR-90-0294

PROJECT NO. 2312

TASK NO. A2

MONITOR: AFOSR, XF
TR-92-0189, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) These experiments are directed at the neurochemical systems and neuroanatomical pathways that control the activity of brain serotonergic (dorsal raphe nucleus) and noradrenergic (locus coeruleus) neurons. It seeks to answer these questions by studying single unit activity in combination with microiontophoresis in the awake cat during exposure to physiologically relevant conditions. Four series of studies are proposed, the first three will examine the neurochemical afferents that control the following types of activity of serotonergic and noradrenergic neurons: (1) tonic, as well as state-dependent activity; (2) phasic activity evoked by various sensory stimuli; and (3) activation in response to environmental and physiological challenges (stressors). The fourth series of studies will take results from the first three and seek to establish the nuclear site of origin of these effects by employing electrical stimulation in combination with single unit recording and microiontophoresis. This research program will provide a critical link for understanding the control of these two important neurochemical systems, and will thus help to elucidate, more broadly, their role in processes such as state-dependent changes in physiology and behavior, and arousal and attention. Serotonin, Norepinephrine, Brain.

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POLYTECHNIC INST OF NEW YORK BROOKLYN DEPT OF ELECTRICAL
ENGINEERING AND COMP UTER SCIENCE

PRECIPITATION, PROPAGATION, PROTONS, SOLAR WIND, STORMS,
TRANSMITTING, WHISTLERS, PLASMA WAVES.

(U) The Role of Hydromagnetic Waves in the Magnetosphere
and the Ionosphere.

IDENTIFIERS: (U) PE61102F, WUAFSOR2311A1, Hydromagnetic
waves, Plasma instabilities.

DESCRIPTIVE NOTE: Final rept. 1 Feb 88-31 Jan 91.

JAN 91 66P

PERSONAL AUTHORS: Kuo, Spencer

CONTRACT NO. AFOSR-88-0127

PROJECT NO. 2311

TASK NO. A1

MONITOR: AFOSR, XF
TR-92-0199, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Four research areas were investigated: (1). the propagation and coupling of hydromagnetic waves in the magnetosphere. The coupled hydromagnetic equations in the dipole model of the magnetosphere were solved numerically. A reconstruction of the long period waves in an actual geomagnetic storm was demonstrated (2). non-linear wave-particle interactions in the magnetosphere. Anomalous cross-field diffusion of trapped energetic protons may result in proton precipitation in the equatorial region; (3). the filamentation instability of large amplitude hydromagnetic waves in the solar wind plasma. This work is relevant to observations of Alven waves and magnetosonic waves in space plasmas; (4). parametric excitation of whistler waves in the high latitude ionosphere by a high frequency heater transmitting from the ground. It has been shown that whistler waves and Langmuir waves can be excited by ionospheric heaters. The instability which produces these waves offers a potential mechanism to generate large amplitude long period waves in the ionosphere.

DESCRIPTORS: (U) *MAGNETOHYDRODYNAMICS, *MAGNETOSPHERE, AMPLITUDE, COUPLINGS, DIFFUSION, DIPOLES, EQUATIONS, EXCITATION, HEATERS, HIGH FREQUENCY, HIGH LATITUDES, INSTABILITY, INTERACTIONS, IONOSPHERE, MODELS, PARTICLES,

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MASSACHUSETTS UNIV AMHERST DEPT OF CIVIL ENGINEERING

(U) Constitutive Modelling for Granular Material under Finite Strains with Particle Slidings and Fabric Changes.

DESCRIPTIVE NOTE: Final rept. 1 May 89-30 Sep 91,

FEB 92 85P

PERSONAL AUTHORS: Chang, Ching S.

CONTRACT NO. AFOSR-89-0313

PROJECT NO. 2302

TASK NO. C1

MONITOR: AFOSR, XF
TR-92-0200, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The overall objective of this research is to develop a constitutive model for granular material under finite strains with explicit consideration of particle sliding and the consequent fabric change. The specific objective of this research is focused on the development of a stress-strain theory that accounts for the microstructure and the non-uniform strain field of the particle assembly. The developed theoretical model is evaluated by results obtained from computer simulation and experiments of granular material. Mechanical behavior of granular media is important in many fields of studies such as soil mechanics, powder mechanics, and ceramic mechanics. The mechanical behavior of granular media has been studied by borrowing the stress-strain models, such as elastic, elasto-plastic, or plastic models, developed for continuum materials. These continuum models consider neither the discrete nature nor the deformation mechanism of granular materials. A more rational approach should be one that considers the granular system as an assemblage of particles. The stress-strain behavior for a granular material is defined for a representative volume which consists of a sufficiently large number of particles to be representative of the material. When subjected to loading, the deformation of the granular system results from particle deformation as well as slip between

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MICHIGAN STATE UNIV EAST LANSING DEPT OF BIOCHEMISTRY

(U) Molecular Mechanism of Dioxin Action: Molecular Cloning of the Ah Receptor Using a DNA Recognition Site Probe.

DESCRIPTIVE NOTE: Final rept. 1 Sep 90-31 Aug 91.

JAN 92 46P

PERSONAL AUTHORS: Denison, Michael S.

CONTRACT NO. AFOSR-90-0354

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR, XF
TR-92-0122, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) We have utilized gel retardation analysis and DNA mutagenesis to examine the specific interaction of transformed guinea pig hepatic cytosolic TCDD:Ahr complex with a dioxin responsive element (DRE). Sequence alignment of the mouse CYP1A1 upstream DREs has identified a common invariant 'core' consensus sequence of TNGCGTG flanked by several variable nucleotides. Competitive gel retardation analysis using a series of DRE oligonucleotides containing single or multiple base substitutions has allowed identification of those nucleotides important for TCDD:Ahr:DRE complex formation. A putative TCDD:Ahr DNA-binding consensus sequence of GCGTGNA/TNNNC/G has been derived. The four core nucleotides, CGTG, appear to be critical for TCDD-inducible protein-DNA complex formation since their substitution decreased Ahr binding affinity by 200- to 2000-fold; the remaining conserved bases are also important, albeit to a lesser degree (3- to 5-fold). Our results indicate that the primary interaction of the TCDD:Ahr complex with the DRE occurs with the conserved 'core' sequence, although nucleotides flanking the core also contribute to the specificity of DRE binding. The optimal DRE consensus sequence is being utilized for screening of cDNA libraries in an attempt to directly clone the gene(s) for DRE binding proteins.

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